THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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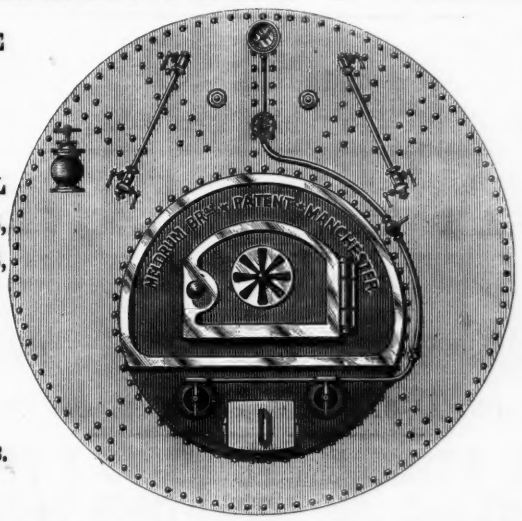

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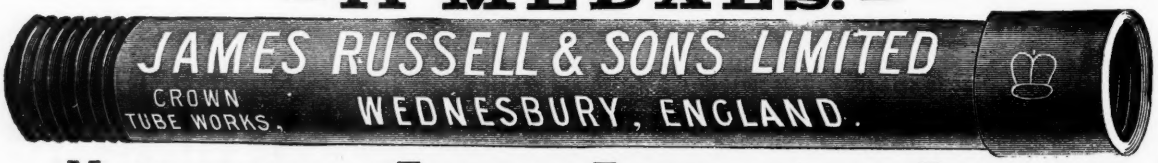

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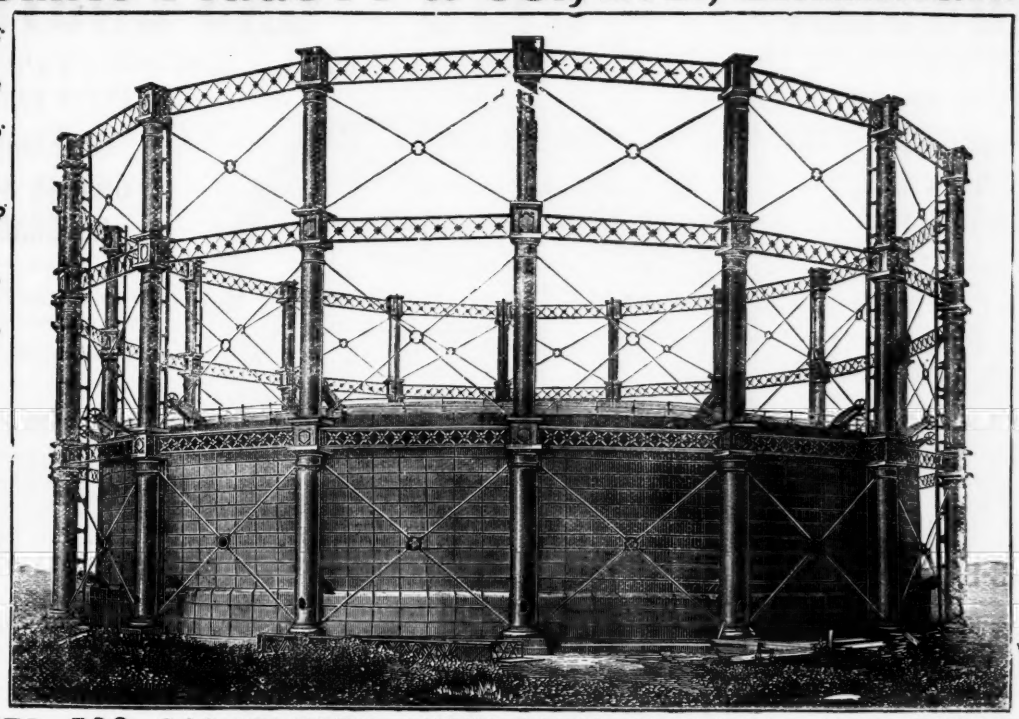

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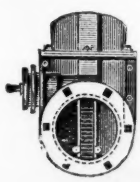

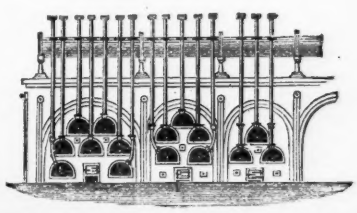

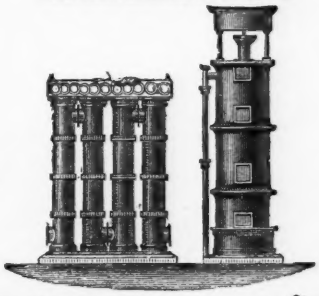

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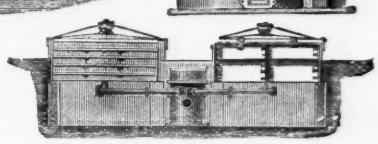

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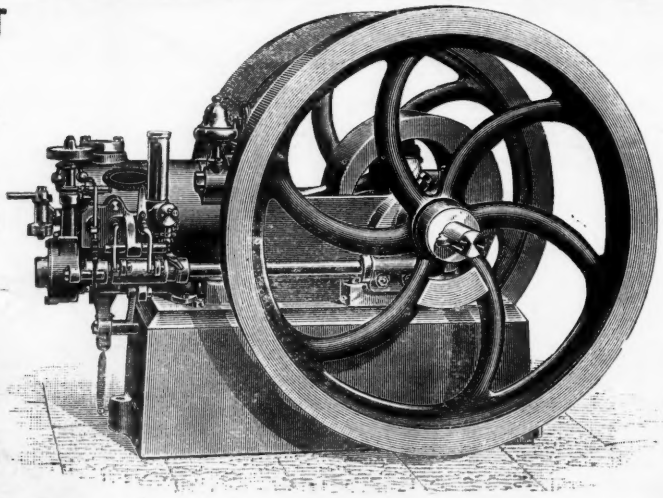

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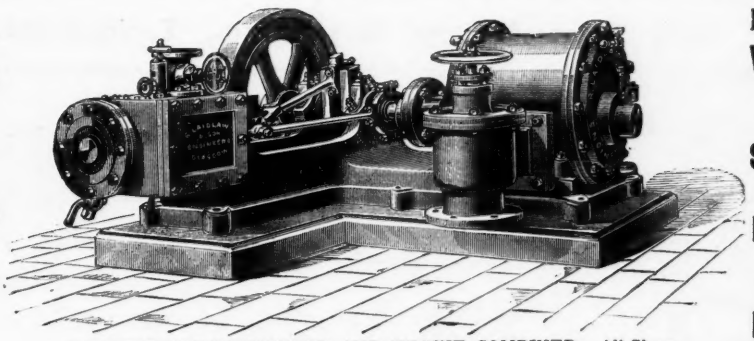

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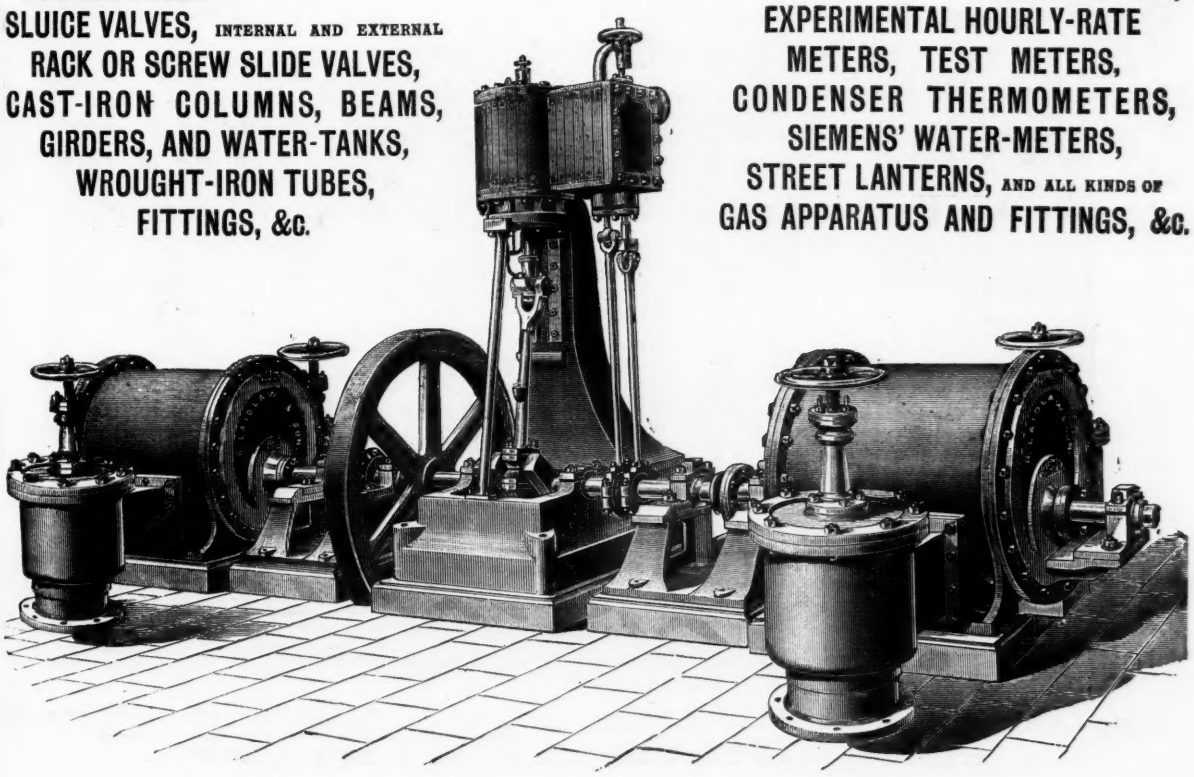

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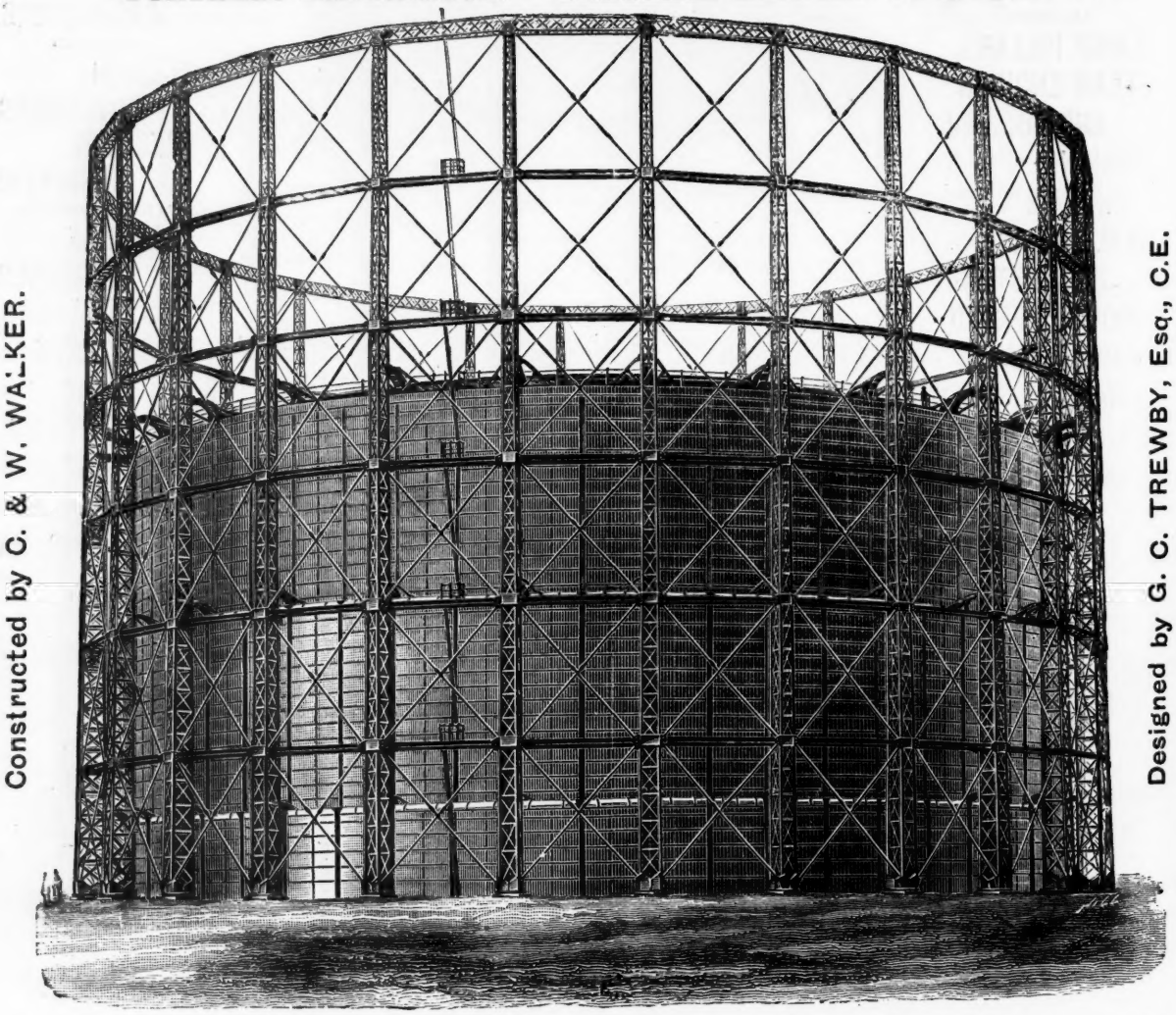

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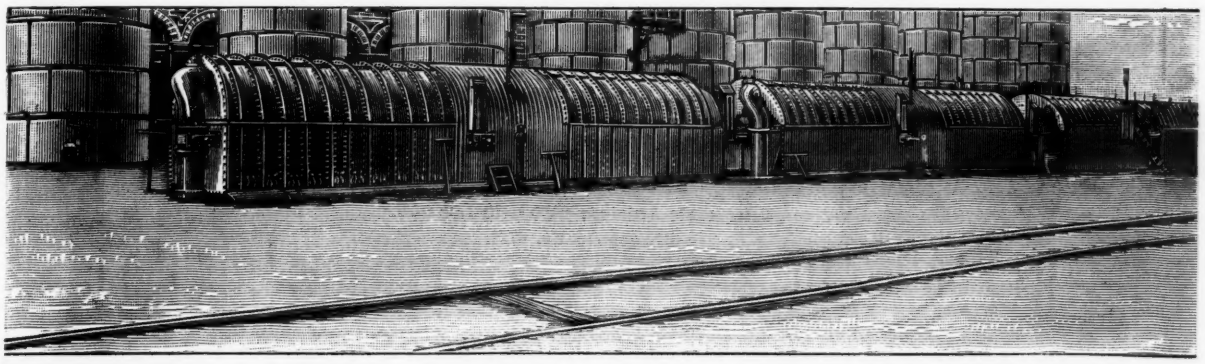

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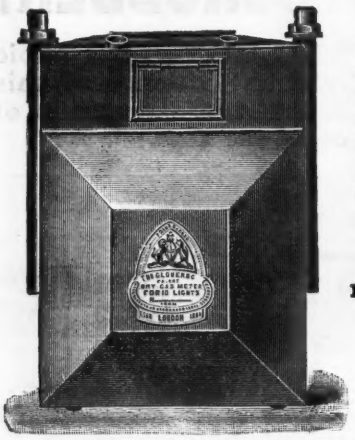

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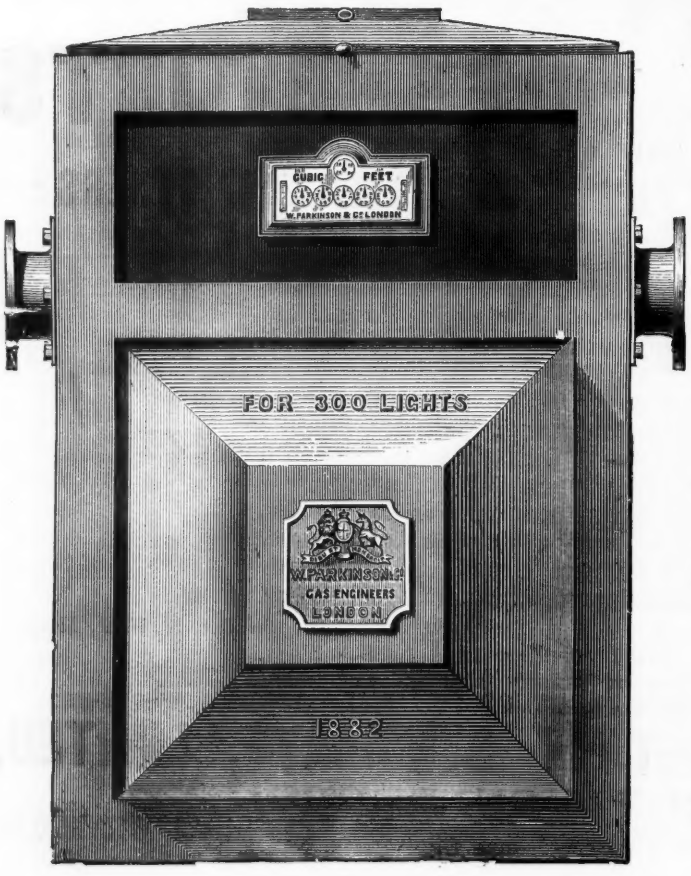

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TO CORRESPONDENTS.

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, AUGUST 29, 1893.

The Employers' Liability Bill.

AMONG the other Government proposals for legislation which are in abeyance in consequence of the abnormal state of the public business in the House of Commons, is the Employers' Liability Bill. Whenever this measure is reached, it will be met with a motion for its recommittal by Mr. Joseph Chamberlain, who is known to hold the opinion that it does not go far enough in some respects, while erring on the side of extreme stringency in others. The Government are being urged by a section of their supporters to "stand absolutely firm" on their Bill; but this counsel is accompanied by a full admission that it was probably the Bill that lost the seat for Hereford to the Government Party, on account of the opposition of the London and North-Western Railway men to the measure. The persistence of the partisans of the Bill, to do them justice, seems to be inspired by the belief which they honestly hold that the railway men do not know what is good for themselves. On the other hand, the men are confident that their view of their position in regard to the Bill is the right one, so far as the safeguarding of their own interests is concerned; and they are therefore quite justified in expressing their desire, in the constitutional manner, by voting against the Party which is identified with the measure. The London and North-Western Railway Company have an admittedly excellent system of accident insurance for their men, which will be destroyed if the Bill should ever become law; and the men think they would prefer matters to remain as they are—being persuaded that they will be worse instead of better off in the event of the passing of the measure. The supporters of the Government, however, assure them that this is a short-sighted policy to take up, even in their own interest, because the Government Bill is calculated to benefit the working classes at large, and consequently, by inference, the employees of the London and North-Western Railway Company with the rest—in the long run. Unfortunately for this contention, it does not appear to rest upon any more valid ground than the presumption which exists in some quarters that the Government can do no wrong, and that the members of the present Administration know better what is good for railway men and everybody else than the objects of their attentions can possibly know for themselves. The railway men demur to this assumption. They have their "bird in hand"—*i.e.*, the accident insurance fund—which they contend protects them against losses for which the Government proposals, if they became law, would leave them no remedy. Why should they give up this advantage in favour of the "bird in the bush" which they, in common with other workpeople, are offered by the Government—if they can get it? The case of the railway men lies in a nutshell; and, as Mr. George Livesey has written to a Government organ to point out, it is also the case of all other workmen who have similar means of protection against the consequences of *every* accident which may befall them when at work. The Employers' Liability Bill would give compensation only to such men as can prove a clear case against the employer—that is to say, to about 5 per cent. of the whole, as the railway men aver, while the remaining 95 per cent. would be left out in the cold. Can it be wondered at that men so circumstanced prefer to stick to their present advantages, rather than trust to the vague assurances of arm-chair politicians that the Government proposals will somehow do them good in the abstract? The trouble is all about the provision in the Government Bill which prevents "contracting out" of the measure, even although this might obviously and notoriously be for the benefit of the workpeople concerned. The party politicians regard this provision as the keystone of the measure; but if the position of the railway and other protected men is adhered to by them, which will certainly be the case, it is a stone which will crumble away, and bring the whole structure down with a run. Why not adopt a compromise, and permit men to contract out of the Act when it can be shown to the satisfaction of an independent tribunal that they will be better off by so doing?

The Lawyer and the Alderman on the Quality of London Gas.

THE Gaslight and Coke Company were up before the Alderman at the Mansion House last Thursday for two deficiencies of illuminating power, and were duly fined 40s. for each offence. The City authorities did not press for costs; and the deficiencies were nothing to talk about. It so happened, however, that Mr. Monier-Williams, the Company's Solicitor, who conducted the cases on their behalf, thought fit to make an exculpatory speech to the presiding Alderman—Sir Andrew Lusk—about the 2255 times that the Company's gas had satisfied the Examiners during the past half year to the twice that it had failed in doing so. his set the worthy, but garrulous, Alderman

talking. Mr. Monier-Williams is an astute man of the world, as well as a lawyer of high standing and repute. It is therefore the more remarkable that he should on this particular occasion have been guilty of the *bêtise* of attempting to justify the Gas Company in the eyes of the particular City Alderman with whom he had to deal. What, in the name of all that is reasonable, is the use of making attempts of the kind upon magistrates, who are purely executive authorities under the Act? When the prosecution seems disposed to be vindictive, it may be wise to urge extenuating circumstances before the Magistrate, or the Alderman, as the case may be. But this was not the case on Thursday; and if the Company's representative had maintained the silence which is more golden than speech, there would have been no opportunity for Alderman Lusk to "play to the gallery" as he did—not for the first time in his magisterial career. The least said the soonest mended in regard to these cases, which the laity cannot be supposed to know anything about. We trust that all officials of Gas Companies who may find themselves in the position of Mr. Monier-Williams on this occasion will, for the future, remember the old saw, and bear in mind that, even if "speech is silvern," this metal is greatly depreciated in value just now.

The Coal Crisis.

At the present moment of writing, it appears as though the South Wales strike is nearing its end; and if this should be so, the prospects of the Federation men will be affected for the worse. In South Wales, the outburst of a hot-headed minority against the terms of employment accepted by the majority, and sanctioned by their own leaders, has been as futile as it was mischievous. Those notoriety-hunters in and out of Parliament who ranged themselves on the side of the strikers must begin to feel particularly foolish by this time, though, of course, they will not say anything about it. At the outset, it was acknowledged on all sides that the position of the employers was "technically" correct; but the usual apologies were offered for those who revolted against their engagements at the dictates of a higher motive, and so forth. It is a wonder that it never occurs to apologists for contract-breakers of this order that their pet way of arguing the point might be inconveniently extended. How would the gushing Member of Parliament, or the perfervid newspaper editor, like to be disturbed from his slumbers by a philosophic burglar, who should assure him—punctuating his remarks the while by rhythmical taps of a "life-preserver" on the cranium—that while the gold watch on the table and the purse in the discarded trousers' pocket might be said to "technically" belong to the politician or the writer aforesaid, it was expedient, in obedience to the dictates of a "higher principle," that they should be transferred to the burglar? Meanwhile, the Federation men are, on the whole, keeping quiet, though the outbreak of a few sporadic acts of violence does not augur well for the strength of the Federation position. There never was such stagnation in the house coal trade as retailers are experiencing at the present juncture. Householders are burning coke, gas—anything rather than play into the hands of the trade by purchasing coal at the current high rates. Accumulations at the pits' mouths are being cleared away at remunerative prices; and the owners are in no hurry to see more coal raised to the surface. All this, however, will not affect the average value of the coal as determined by contracts, upon which wages are calculated. There was a meeting last week of the Federation Executive, which came to nothing; and there was also a gathering at which Mr. S. Wood, M.P., talked a lot of rubbish about the iniquity of coal-owners selling their produce at cheap rates to wealthy firms who could afford to pay more. So long as the men's leaders indulge in this vain kind of talk, the public will hold the opinion that they do not know anything about the nature of the industry which they would like to control in their own way, and will incline to the conclusion that the employers, who say little, and that to the purpose, are better worth listening to.

Co-operation at the Crystal Palace.

It was mentioned in the course of an article on labour conditions in Australia which appeared in our last week's issue, that the Australian unionists are seeking in Co-operation a remedy for the evils of their position which strikes with violence have failed to cure. It is worthy of remark that during the past week a Co-operative Festival has been in progress at the Crystal Palace, which has served for a sort of stock-taking of the state of the Co-operation Movement. On the whole, the report seems to be fairly satisfactory, although the smallness of the impression that has yet been made by co-operators upon the industry and trade of the country disappoints some of its most eager and impatient partisans. There is always a party of extremists in social and industrial causes which is dissatisfied if their avowed end is not reached in a skip and a jump. Like the old school of geologists, they would willingly invoke a cataclysm if they could not find any other means of carrying their views into effect. It is very funny, moreover, how jealous the newer sort of Socialists who have taken Co-operation, together with Trade Unionism, under their patronage, are of anybody not of their own company who ventures to express approval of the objects of such movements. Co-operation was started before the Socialists in question were heard of; but nevertheless they have essayed to take possession of it, and they bray furiously at any benevolent person who speaks well of it without using their language. This spirit of intolerant jealousy has broken out conspicuously, in a London daily newspaper, over the devoted head of Mr. George Livesey, who seems to be suspected, by the upholders of Trade Unionism, of possessing the "evil eye," for they are deeply offended if he so much as looks in their direction. "Whether the patronage and encouragement of Mr. "George Livesey, and gentlemen of his kidney who "believe in Co-operation as a means of extracting the "sting from Trade Unionism, will do the co-operators "much good, we," says the newspaper in question, "beg "leave to doubt. Their theories are repudiated by the "main body; and the latest utterance of Mr. Livesey, "in his capacity of Chairman of the South Metropolitan "Gas Company, will scarcely rehabilitate the character "of profit-sharing in the eyes of the workers. The share-"holders may have been pleased enough with the informa-"tion that the bonus paid to the workmen under the "profit-sharing arrangement cost the Company nothing, "as it was obtained from the improved working of the "men themselves; but what of the generosity or the "justice of a system which avowedly defrauds men of their "wages?" This is a fair sample of the "fustian" that does duty for Progressive ideas. It is on a par with the utterances that discredit thrift and saving on the part of the working classes, lest employers should take advantage of the men who exercise it, with the denunciation of Sunday as an inexcusable limitation of the right of men to labour whenever they choose, and all the other silly outcomes of Continental Socialistic dreamings that pass current as the "advanced opinion" of the day. It is pretty certain, however, that most of the working men to whom these diatribes against the South Metropolitan Gas Company's system are addressed would be only too glad if they could be "defrauded" in the same way for whatever care and superior efficiency they might be able to show in the course of their daily work.

A Warning and an Example.

Some few years ago, a Parisian humorist made fun of the modern tendency to specialism in periodicals, which has the effect of providing journals devoted to every imaginable industry and interest of civilized man, by complaining that there was no *Journal du Custodien de l'Arc de Triomphe*, or, as we should say, no *Gazette* of the Clock-Winder of the Houses of Parliament. It occurred to this jester that individuals who could not be classified as belonging to any regular trade, ought not on that account to be deprived of the comfort and solace of a trade journal to advocate their interests and make known their wants. If he still lives, he might change the burden of his complaint, and insist upon the right of every man to have a Trade Union all to himself, if his occupation forbids professional association with his fellows. The world is fast getting into the way of accepting the right of combination for all sorts and conditions of workers; and if a particular individual is so situated as to be ineligible for any duly established Trade Society, there is no logical reason why he should therefore be deprived of the sacred right of combination. Most New Unions formed to make into the semblance of trades, occupations which are not trades, start with the definition of the titles and emoluments of the permanent officials, and follow on with a statement of the rate of

subscriptions payable by ordinary members. It is evident a one-man Union could be conducted very economically, while it is tolerably evident the single member could be trusted to do everything in his power to "increase the rate of wages, decrease the hours of labour," and look after the other usual objects of "trade" combinations quite as efficiently as the ordinary paid Union Executive, and a good deal better than most. Failing an example of a one-man Union, which the native sense of humour of Englishmen, ineradicable by any surcharge of German Socialism, would not permit, the next best thing of the kind is obviously a Union of men in one employment. This we have actually in existence, under the awe-inspiring name of the "United London County "Council Employees' Labour Union;" and a bright example of its kind it appears to be, if one may judge from the reports of its proceedings that occasionally find their way into certain "popular" newspapers. It is of no consequence that the men in the employ of the County Council, in their capacity as drivers, sweepers, garden hands, or what not, have "Trade" Unions clamouring for their weekly threepences; they must form a Union having sole reference to their paymasters, or incur the bann of the enterprising gentlemen who require the additional subscription attaching to membership of this special organization. The scheme of this variety of Unionism is beautifully simple. First, somebody gets the County Council to pass a resolution in favour of paying the "Union rate" of wages; and then the employees of the Council form a Union which has the single principle that every man's wages shall be 2s. per week more than he happens to be getting for the time being. Shall anybody deny the right of the men to combine? Perish the thought! Shall not the Council carry out their own resolutions? Why, certainly! Then, there you are! The scheme is so remarkably clear that even the Progressive majority in the County Council are able to see it, and objections are raised. Thereupon the suspected Union holds a "mass meeting," and threatens to make it warm for certain members of the Council at the next elections. It is a very pretty quarrel as it stands, and one is loth to step between the parties. In the overlooked interest of the ratepayers, however, it may be as well to point out to what this kind of thing is likely to lead, for which it is only necessary to look to New York, where the employees of the Municipality do not find it necessary to form a Union, since they are all ward politicians. Hear what the *Scientific American* has to say on this subject: "It is really sickening to see how lazy and "dishonest men become as soon as they are employed on "public works in New York City. . . . The sense of "honour and honesty in doing work seems to have left the "men. This is the main reason why New York City has "suffered so long from dirty streets. Hundreds of men are "employed to do the work, but they cheat the city. They "pocket their wages, but evade the labour. They require "to have overseers who will stand by to watch and whip "them up to duty. These overseers, the city does not "furnish. If they did, the men would rebel at the polls." Somebody says the only hope of deliverance is through the introduction of machinery to do the street sweeping; but it might be argued that a clean sweep of the local political system would be more to the purpose.

WATER AND SANITARY AFFAIRS.

A GENTLEMAN resident in Chelsea wrote to *The Times* a few days ago, complaining that "36,000 houses" in the south-western district of London were, on the day of his writing, "without a drop of water." Apparently such was the case in his own dwelling; but whether he could answer for all the 36,000 houses in Chelsea may be doubted. He was evidently hot and angry; and, considering the state of the weather, it must be allowed that his position was somewhat trying. The Secretary of the Company had prescribed "patience;" but the advice seems to have been thrown away. A main had burst at Kingston, causing a suspension of the supply; and this irate consumer considered that all the 36,000 householders should have been informed of the occurrence forthwith. The Secretary declared that this was impossible; but the Company's entire outdoor staff were sent forth to give warning as far as they could, so that the consumers might husband their resources. Apparently the Company's messengers missed this particular gentleman; and he wrote to *The Times* very much as if nobody had been warned. But the most important point of all was not so much the failure to give a universal notice, as the circumstance that the supply of water had been suddenly cut off. If this was the fault of the Company, it was indeed a serious matter. But such was not the case, although the complaining gentleman, Mr. Alfred Janssen, stated in his letter to *The Times* that the Company "appeared to have no second main." Had this been the condition of things, it might have been urged that the Company ought not to depend on a single line of communication. But the truth was that there were three mains at Kingston; and when the Company's Secretary (Mr. G. H. Gill) wrote to *The Times* explaining this fact, Mr. Janssen replied saying he had made no "statement "as to the Company having one main." The only thing, therefore, which might have afforded some basis of complaint proves to be a myth. So much having been done to secure the supply against interruption, it was especially unfortunate that the bursting of one caused all three mains to be submerged; and it appears that an enormous quantity of water had to be got rid of, in order to discover where the fracture existed. The whole affair was an accident; and the Company did their best to cope with it. Even a County Council could have done no more. The burst having taken place on a Friday, the main was repaired and re-charged early on the Sunday morning. A question was asked in Parliament, suggesting an inquiry into the circumstances connected with the mishap; but the President of the Local Government Board said, in reply, that he did not think any practical advantage would result from such a proceeding. There is, however, one good lesson to be learned which ought not to be overlooked. Let us suppose that these three mains had all been merged in one huge pipe, having its commencement somewhere away in Wales or Devonshire, and that, instead of 36,000 houses being thereby served, the number had been nearly 800,000. How would "notice" have been given then? and what would have been the extent of the inconvenience? The Chelsea Company managed well. The complaints received by the Secretary are described as "remarkably few;" and the only grumbler in *The Times* is Mr. Janssen, who, we trust, will never again be in straits for a drop of water. It is rather singular that one of the New River mains burst on Sunday night at King's Cross. In this case, there is likely to be a complaint of too much water, rather than too little, in certain quarters.

The weather during the month of July was not favourable to the quality of the London Water Supply. The long drought which prevailed nearly to the end of June was followed in July by a somewhat excessive rainfall; the quantity falling at Oxford during the month exceeding the average by more than an inch. An increase in the amount of organic matter swept into the river was the natural result; but chemical analysis shows that this must have been chiefly of vegetable origin. The facts are dealt with in the monthly report by Mr. Crookes and Dr. Odling; and it is noticed that, while there has been a slight addition to the quantity of organic carbon, the proportion of nitric acid has risen—proving that, whatever may have been the source of the organic matter, "the self-purifying "power of the stream was well able to deal with the "nitrogen present." The ratio of brown to blue in the colour of the water supplied from the Thames and the Lea is considered to indicate a peaty origin for the organic admixture—a conclusion which harmonizes with the reduction observed in the amount of common salt. Considering that the sudden and heavy rainfall followed one of the longest droughts on record in this country, the effect on the quality of the Metropolitan waters clearly points to "a very high average standard of purity." The supply obtained more or less from the Thames and the Lea has in this respect undergone a test which has yielded a decidedly satisfactory result. This has likewise been associated with an enormous volume of supply—such as must have thrown a considerable strain on the appliances employed by the Companies for subsidence and filtration. On one occasion the water was "dull" though clear; and in every other instance it was clear and bright. The "dull" sample had an excess of brown, for which a peaty source may well be accountable.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 418.)

REGULAR readers of this column may perhaps remember that our financial article did not appear in last week's issue; but in order that the continuity of the articles may be preserved, we briefly recapitulate the salient features of the omitted week, and record that, owing to the excessive quietude in all quarters, prices were disposed to fall away for lack of support. The condition of the Money Market, also, kept things down; it being generally apprehended that, even the advance in the discount rate to 4 per cent. would not prove sufficient to stop the drain upon the Bank's resources. On the other hand, a favourable tendency, which checked any fall upon a large scale, was imparted by the assurance of the fortnightly settlement being adjusted without great difficulty. The Gas Market was fully as inactive as the rest; but this did not affect the firmness which has so long characterized it—Gaslight issues being conspicuously in front. The daily operations were so restricted as not to call for detailed notice.

Coming now to the week just closed, the condition of affairs is found to have undergone hardly any change. The general quietude remains unbroken; and there is scarcely any ebb or flow in prices. On the whole, they are rather lower, especially in the higher class securities more immediately affected by the condition of the Money Market. True to the forecast widely formed, the Bank of England rate was raised on Thursday to 5 per cent.—a measure forced to a considerable degree by the action of Continental bourses in regard to the American demand. With dear money and lack of support, prices accordingly tended downward. The Gas Market, however, though sharing the inactivity, did not participate in any way in the drooping tendency. On the contrary, the persistent firmness was well maintained. Gaslight "A," which opened at 225½, was done at 227 on the closing day; and the secured issues were in good demand at the improved *ex div.* figures. Not a single transaction of any sort was marked in South Metropolitans, and only one in Commercials. Suburbans and Provincials were unchanged, and wholly destitute of incident. The Continental undertakings were very firm; and Imperial advanced in price. None of the rest presented any feature, except Bombay, which, for special reasons, was easier. The Water Companies were very quiet, but firm, though Chelsea alone improved in value.

The daily operations of the week were too slight to require very specific notice. No change occurred until Tuesday, when Bombay receded ¼; but Chelsea Water gained 2. On Wednesday, Imperial Continental improved 1. From that day forward, Gas issues remained without further change; but in Water there was another advance of 1 in Chelsea.

ELECTRIC LIGHTING MEMORANDA.

The Affairs of the Brush Company—The Prospects of the Incandescent Lamp Trade—The St. Pancras Dispute.

THE fourth annual general meeting of the Brush Company has been held, and it passed off in most amicable fashion. The report of the Directors stated that the profit and loss account for the past year shows a gross profit of £50,158, including the balance brought forward from the last account. The net balance available for the payment of dividend amounted to £26,394, out of which the full 6 per cent. preference dividend and 7 per cent. on the ordinary shares has been declared, besides wiping out the whole amount still standing to the debit of the preliminary expenses account. The Directors also reported the general business of the Company as being in a flourishing condition; and they announced that, when the Edison lamp patent expires, they will be in a position to come forward with a lamp of their own manufacture at a price of 1s. 6d. apiece. In moving the adoption of the report, the new Chairman of the Company (Mr. J. B. Braithwaite), who has succeeded the Duke of Marlborough, laid particular stress upon the increase of activity at the Loughborough manufactory, where all the mechanical work of the concern is now concentrated. Both the capital obligations of the Company and the stock in hand show an increase for the year; but this circumstance was, of course, described by the Chairman as favourable. It was also stated that the Company's shops are full of orders, and that they are getting their fair share of such installation work as may be going. The Directors look to the extension of electrical traction to supply a new branch for their manufacturing department; and not a word was said by the Chairman about spawning any more concessionary undertakings. It may therefore, perhaps, be concluded that this era in the history of the Brush speculation is closed. It is worthy of notice how, after all the splashing and commotion of the "flush times," when concessionary ventures were being launched every week, almost every day, for all parts of the world, the few electrical engineering companies that have managed to survive to the present time find their account in carrying on the same sort of humdrum manufacturing business that was practised by old-established engineering firms before the long-since discredited Yankee methods in electrical promotion were ever heard of.

There is a passage in the preceding paragraph relating to the prospects of the trade in incandescent lamps when the Edison master patent shall have expired, which calls for separate notice. The Chairman of the Brush Company in one breath holds out cheerful anticipations of the impetus that electric lighting is to receive when the market prices of incandescent lamps are reduced by some 50 per cent. This consideration, he affects to think, will cause many people who now hold back to adopt this means of lighting. Supposing the initial cost of introducing the electric light into a house to be £100, it may be matter for argument whether a possible saving in lamp renewals of 30s. a year or thereabouts is likely to prove a great inducement to householders to do in 1894 what they will not afford in this line in 1893. However this may be, it is doubtful if the reduction in the price of incandescent lamps to 1s. 6d. or less will be to the advantage of the trade; for the Brush Chairman himself, in the course of his speech to the shareholders, apologized for a large diminution of the Company's profits in Austria "owing to the competition in glow lamps." What has already come to pass in Austria will be the case here after November next; and whether the general public take to the eighteenpenny incandescent lamp with enthusiasm or keep a cold shoulder to it, we quite expect the people engaged in the trade to complain about this time next year that the termination of the Edison monopoly has failed to do them any good, because there is no profit in the business.

The dispute between Mr. Clements, of the St. Pancras Vestry, and the Vestry Clerk and the Consulting Electrician, on the subject of the financial results of the parochial electric lighting speculation, has attracted the attention of the *Electrical Review*, which has devoted a lengthy editorial article to an examination of the question in the candid, independent style of criticism which distinguishes that publication. Our contemporary has discovered by the first glance at the explanatory pamphlet which we noticed a fortnight ago, that the controversy between Mr. Clements and his official adversaries has been conducted with an accompaniment of recrimination which resolves the whole thing into an unseemly squabble, in which personalities occupy a prominent position, to the obscuration of the main points at issue. But what else was ever to be suspected of an affair of the St. Pancras Vestry? Mr. Gibb, the astute and experienced Clerk to the Vestry, has not occupied his position for a whole generation of vestrymen without learning how to carry a point with a body of this character. It is a testimony to his shrewdness that he converted the dispute, which, as our disgusted contemporary observes, should have turned upon simple statements of figures, into a personal question affecting his adversary. However, the *Electrical Review* now undertakes to look into the matter on its merits, and discards both the methods of statement adopted by Mr. Gibb and Mr. Clements respectively. The question of the financial position of the St. Pancras electric lighting undertaking hinges upon the treatment of the cost of public lighting, and the necessity or otherwise of allowing for depreciation of the plant, and including charges for rates and administration. Our contemporary rightly says the public lamps ought to be charged for. It thus brings the balance on the year's working of the undertaking down to £1077, without allowing for the liabilities already named. In his original estimate of working expenses, Professor Henry Robinson allowed £3400 a year for depreciation. Mr. Clements has taken him at his word, which Mr. Gibb, and Professor Robinson after him, protests is unfair, because the plant is all new, and is kept up by continual repairs. The *Electrical Review* sides with Mr. Clements upon this point, and expresses astonishment that Professor Robinson should have been led to turn his back upon his own figures. We are not so much surprised at this as we should have been to see an electrician's estimates confirmed and adhered to in practice. The net result of the criticism by our contemporary of the "bone of contention" in St. Pancras is that both parties have exaggerated their case, and that the working of the undertaking shows a "loss of from nothing to £2000 on the year, according to the charge made for depreciation."

Manchester District Institution of Gas Engineers.—The 95th quarterly meeting of this Institution will be held at Nottingham next Saturday, under the presidency of Mr. W. R. Chester, the Corporation Gas Engineer. A long programme has been issued by the Honorary Secretary (Mr. S. S. Mellor, of Northwich); and to get through it the members will have to reach Nottingham on Friday evening. On their arrival, arrangements have been made for them to visit the Castle Museum and the Natural History Museum at the University College, where an extensive installation of lighting and ventilation by gas has lately been applied. The first thing the following day there will be an inspection of the new subways; after which the Eastcroft and Basford Gas-Works will be visited. At the latter, the Gas Committee will provide luncheon. The business portion of the programme will consist simply of the election of Mr. E. Jones, of New Mills, and Mr. J. Bailey, of Middlewich, as members. The afternoon will be devoted to a visit by coach to the Giltbrook Chemical Works,

HOUSE WARMING—AN APPEAL TO ARCHITECTS.

It is a common complaint of sanitarians, gas engineers, and others interested in divers senses in the great problem of town improvement, that architects too frequently neglect the means placed at their command by modern engineering science for dealing with the requirements of town dwellers in the important matters of lighting, warming, cooking, and ventilation. The architect of the present day is a highly accomplished, tasteful, and learned gentleman as compared with his predecessor of forty years ago; but in too many cases his capacity for assimilating new ideas in regard to the construction and fitting of houses does not appear to equal his acquaintance with the canons of the decorative side of his art. The English architect is more practical, as a rule, than his Continental brother, who is content to design a magnificently ornate façade for business premises, only to have it spoilt by clumsily made shop-window shutters and hideously assertive placards. In many of the principal thoroughfares of Paris or Vienna, for example, one may see blocks of commercial buildings finished in a style that with us would hardly be equalled for Government or Municipal offices, which might just as well have been left plain, so disfigured are they by the name-boards of the shopkeepers, for which the architect has made no provision. In this country the architect's shortcoming is of another character, inasmuch as he too often ignores the consideration that town dwellers need conveniences in respect of the matters already mentioned superior to, or differing from, those which serve well enough in country districts. First among these comes the lighting, both natural and artificial. The æsthetic architect, being desirous of preserving the appearance as well as to secure the fact of solidity of construction, hates large, gaping windows and wide surfaces of plate glass. There has been manifest, in the latest reconstructions in the commercial and residential streets of English towns, a tendency to return to the small panes of glass and even to the leaded lights of our forefathers. While admitting that there is much to be said for this taste, which enables the walls of buildings to be kept of a proper strength, and imparts to the inmates that sense of being "indoors" which gaping glazed voids would dispel, it must be remembered that town skies are dull and town air is thick, and that interiors which are made so gloomy for the sake of the appearance of a façade as to necessitate the employment of artificial lighting in the daytime throughout the greater part of the year, cannot be classified as architecturally successful. A dreadful example of this kind of architectural shortcoming is the Law Courts in the Strand, which may be, as they are claimed to be by the architects of the "school of Street," a splendid study in French Gothic, but are nevertheless a fetid, dingy rabbit-warren within.

Just the same consideration applies to the artificial lighting. Plenty of light is required in town buildings; but how often does the architect provide in a proper manner for the high-power recuperative gas-lamp, which is the very thing for banks, warehouses, shops, dining-rooms, and a host of other applications? Plenty of gas involves, of course, ample ventilation, which the recuperative lamp will help to create if wisely handled. But instead of this, the very modern architect will prefer to fall back upon electric lighting, in the vain hope that by this subterfuge he will escape from the ventilation problem, which he has seldom the courage to face. This is indeed a vain hope; for if the new idea of electricians to use incandescent electric lamps for cooking purposes serves no other useful turn, it will explode the delusion that the need for ventilation does not exist where the electric light is employed.

Some little time ago, Mr. Wyke Bayliss, delivered a suggestive address to the Society of Arts on the general subject of the relation of the fine arts to the sanitary condition of our great cities, in which he established the position that the happy cultivation of the æsthetic side of modern town life is more closely dependent upon the proper treatment of sanitary matters than appears at first sight. He said truly enough that to most of us our great cities, whatever else they may be, are our homes; and that when our short English summer is over, as this present season soon will be, and the dark days of winter are upon us, "it is a matter of no small moment with us what our home is like." After the holidays are over, we come back to town, "and we know not whether, when we get up in the morning, we shall be able so much as to see each other's faces across the street." Dirt, in the atmosphere, omnipresent, irremovable, stops the way of everything—of architectural decoration as well as of the traffic in the thoroughfares. "Just think, for example," says Mr. Bayliss, "what the façade of a public building might be, but for this all-pervading, ever-increasing plague of atmospheric dirt." He goes on to say that there was a time when people saw the splendour of Westminster Abbey, its delicate tracery, its wealth of statutary, its shafts of marble, all long since lost to us in the veil of black slime that covers everything in London. "Why is the loveliness of the natural colour of stone to be seen only by a handful of villagers, or the inhabitants of a small provincial town? Why not by the toiling millions of the Metropolis? The buildings are there. Beneath their shadow runs the perpetual stream of human life. St. Paul's in the East, Westminster Abbey in the West, each with its own splendour, and the stream of life for ever ebbing and flowing, like the great river that runs between them. But the river is thick with mud, so that the people cannot drink of it; and St. Peter at Westminster, and St. Paul in the City, looking out over the surging masses, cannot see each other, for the air is black with smoke." This is not all due to the climate, but to the climate *plus* dirt; and it is the dirt that Mr. Bayliss wishes to have cleared away, in order that people may see themselves, and the places they live in, all the year round.

It was an eloquent address, intended to set forth an ideal, and not concerned with practical remedies for the evil complained of. The most hopeless of the many bars that stand in the way of the realization of Mr. Baylis's ideal, however, is the callousness of his brother professionals, who go on multiplying fireplaces and chimneys in the buildings which are making not only a new London, but also a new Manchester, Liverpool, and Birmingham under our eyes, as though the smoke that "so gracefully curled" from the cottage chimney in Moore's poem were equally beautiful always and everywhere. Now this callousness, or ignorance, is inexcusable. If our English architects would use for their new town buildings only the means lying actually at their hands—gas and coke—they might do more towards clearing the atmosphere of London than is generally suspected to be possible.

This statement is not made at hap-hazard, but is capable of being supported by illustrative facts, which also go to show, moreover, the difference of force that exists between motives of private convenience and economy, and any sense of what the individual house-owner owes to the public interest. In the United States, architects, builders, and householders are not more conspicuously public-spirited than are the same orders of the community in England; but new houses in the best parts of towns in the States are commonly made smokeless and well ventilated, simply because private considerations of comfort, and the difficulty of procuring efficient domestic servants, govern the problem of house warming as it appears to an American householder. The American likes his house well warmed—extravagantly heated, as we should say—for nearly one-half of the year; and not only will the common open fireplace not do this satisfactorily, but it cannot be attended to in the orderly British fashion. In short, the American householder is compelled, for his own sake, to solve the same problem that the British householder declines to attack in the public interest. How the former goes to work may be learnt from a recent description in the *Engineering Record*, of an example of warming by what is called "indirect radiation," as applied to a Boston residence. The house in question is a three-storey and basement brick structure, occupying a site about 50 feet square. A feature of the heating apparatus is the arrangement in the basement, or cellar, where the boiler and all the radiators for warming the air are enclosed in one central brick chamber, which stands directly under the hall. Into this chamber opens the fresh-air supply—a brick flue 30 inches in diameter. The outer end of this flue is protected by a grating and filtering screen, to which, if in England, charcoal filtration might be applied in times of fog. The amount of air drawn in is regulated by dampers. After passing round the boiler, which is heated by a slow-combustion furnace requiring attention probably only once in twelve hours, the air is taken off by sheet-iron flues, varying in diameter from 14 to 8 inches, into the various apartments, which have their fireplaces also, and are provided with foul-air flues discharging into the chimneys. Direct radiators—*i.e.*, hot-water coils—are fixed in the attics, and in one or two chambers underneath large windows, for use in severe weather and to temper possible draughts. The apparatus was designed to furnish a large quantity of fresh air and to maintain it at a temperature of 70° Fahr., with the air outside at zero; and it is reported that this result was accomplished (notwithstanding the cold of last winter) with a consumption of about 10 tons of anthracite coal.

It is evident that this Boston house-warming apparatus had a great deal more to do than would ever be required of a similar plant in this country. To begin with, we do not believe in maintaining the temperature of our apartments at a temperature of 70° Fahr. all the year round, but are well content with 60° in winter. Again, the outside air seldom falls far below the freezing point with us; or if it does, the cold is rarely of long duration. What we suggest is that in the United Kingdom a town residence or commercial building supplied with large quantities of slightly warmed air night and day would scarcely require any other means of heating for more than a fortnight or so in the year; and this could easily be supplied by a gas-fire. The warmed air supply could, of course, be kept up by means of a slow-combustion coke-stove; and every house so equipped would do more to mitigate the smoke nuisance than all the lectures of all the sanitarians in England. It is to humble effort in this direction that we commend the architects who, reading Mr. Bayliss's address, may be inclined to think a smokeless London is unattainable. So it is, if everybody waits for some catastrophic method of deliverance. But if all who have the power do their little best, the end may be attained sooner than might now be thought possible.

The Chairmanship of the Singapore Gas Company.—Mr. Samuel Spencer, of the firm of Messrs. J. E. and S. Spencer, has been appointed Chairman of the Singapore Gas Company, in succession to the late Mr. R. S. Foreman.

THE SHEFFIELD CORPORATION AND THEIR WATER UNDERTAKING.

SHEFFIELD is a town that has come into prominence in the English history of water supply. The dire calamity in the Loxley Valley (due to the bursting of the dam of a huge reservoir) has not been forgotten, though it occurred nearly thirty years ago. From that day forward the Sheffield Water Company had troublous times. The record of their parliamentary contest with the Sheffield Corporation has been duly preserved in the pages of the JOURNAL; and readers who turn back to our issues in the spring of 1887 will find that, in connection with the acquisition of the works by the Local Authority, the financial events which we then forshadowed have in some respects already come to pass. It was pointed out in the JOURNAL at the time that, amongst other things, it would be found very difficult for the Corporation to maintain the then current supply of water to the town under the scale of the 25 per cent. increase to which the Company vainly asked Parliament to give a continued sanction. It is true that one of the witnesses examined on behalf of the Corporation estimated that if the Corporation bought the undertaking at the suggested market price of £1,600,000, it would mean buying a net income of £51,434. Yet he had to admit that the charge for income and sinking fund for sixty years would amount to £76,760; thus showing a deficit of upwards of £25,000 a year. This difficulty, however, was in some measure overcome by the Commons Committee approving of what was objected to by the Lords' Committee—viz., the suspension of the Standing Orders of Parliament for the purpose of spreading the repayment of borrowed money over ninety years, instead of sixty years. There were, nevertheless, other financial features of a formidable character to be considered; and, bearing these in mind, we did not hesitate six years ago, to congratulate the Company on the terms upon which it was ultimately settled that they should be bought out of their property.

There was one probability in particular to which, at the time, Mr. Percy Blakelock, the Chairman of the Company, pointed a warning finger—viz., in regard to the cost which would have to be incurred in providing for the future storeage of water. To-day it is found that the Sheffield Corporation are face to face with a stupendous difficulty, and an unlimited outlay in respect of this very necessity. The gravity of the situation may be gleaned from the report which recently appeared in the JOURNAL of a meeting of the Sheffield City Council. The Water Committee brought up on that occasion a special report in reference to the Damflask wing-trench, and asked for a further vote of £24,129 to enable them to carry on the work. With this object, another loan will have to be raised, with the sanction of the Local Government Board; and if this were the end of the story, the ratepayers of Sheffield would doubtless be well content. It will be impossible, however, for them to contemplate the prospective situation with equanimity when they read the explanatory remarks of Mr. Alderman Gainsford. The Alderman, who spoke with evident trepidation and much uneasiness, confessed that the Committee over which he presides had met in conclave three times before placing their report on the minutes. Nor is this at all surprising. It seems that the first estimate of the cost of the work now in hand was £13,882, which was subsequently increased to £28,882, and this in turn has developed into the sum of £53,000 by reason of the further sum which it is now proposed to borrow. Assuredly, Alderman Gainsford was within the mark in saying that these are extremely serious figures. But still more serious is the intimation that even this huge estimate, in its third enlargement, must not be looked upon as final; for the speaker wound up by saying that neither the Engineer nor the Committee must be understood to say that even £52,000 will really finish the work.

The significance of this warning can scarcely be over-rated. It probably means that both the Committee and the Engineer are morally certain that, later on, a further vote will be necessary, and that they have but the vaguest idea at present of the sum that will be finally required, if, indeed, in this undertaking there is any finality at all. It must be distinctly disquieting we say to the people of Sheffield to learn, perhaps for the first time, that they have embarked upon an enterprise "of such a character that no one—not even the best engineer in the world—can form an opinion as to the ultimate cost." In emphasizing this, we do not desire to make reflections upon anybody concerned in the work referred to. But, in the circumstances, it cannot be expected that Mr. Alderman Gainsford's recent observations could pass unnoticed, or that the construction of the Damflask reservoir would, in its engineering and financial aspects, escape close criticism. No doubt, to some extent, the Sheffield Corporation—or rather those upon whose purses the draught is made—are the victims of circumstances which could not well have been foreseen. The supposition was that a water-tight foundation would have been found at a depth of 60 or 70 feet; instead of which, the excavations have to be carried to a depth of 100 feet and more, and the journey downwards is not yet ended. Then, too, the length of the trench has had to be extended for double the distance that was originally anticipated. So also in other departments of the work. In fact, in each case the quantities are about double those which were allowed for in the first estimates. This, we say, is a grave matter; but graver still, we must repeat, is the uncertainty which prevails as to the ultimate accomplishment of the work, and the total outlay for which the ratepayers of Sheffield are to be made liable.

NOTES.

The Decomposition of Steam by Heated Metal.

Herr Rosenfeld has devised a very pretty means of illustrating the decomposition of steam by a heated metal, which may make a really pleasing addition to the platform resources of a lecturer on water gas. For the purpose of the experiment Herr Rosenfeld employs a small quantity of powdered magnesium, introduced into a short length of combustion-tube fitted at one end with a stopper and tube for the escape of gas, and connected at the other end with a vessel containing water. If this vessel is gently heated, while heat is also cautiously applied to the tube containing the magnesium, steam passes over and the metal merely glows—absorbing the oxygen, and delivering a steady stream of hydrogen, which can be collected over water. If the evolution of steam is increased, so as to send a rapid current through the tube and over the heated metal, the latter burns with a dazzling light, and the heat soon breaks the tube. Before this can possibly happen, however, and necessarily end the experiment, a good deal of hydrogen will have passed over and been collected in the bell jar. The sequence of operations makes a highly effective lecture experiment.

Pneumatic Conveyors for Coal.

As an alternative to the mechanical conveyors for coal, &c., which are getting into such a vogue with gas managers and others having large quantities of heavy pulverulent material to move, Messrs. Samuelson and Co., of Banbury, are introducing a system of pneumatic conveyance, which has been tried with much success in the United States, and has also been adapted to the ash-lifts of steamships. The simplest form of the plant, such as is capable of dealing with coal slack or breeze, consists of a Root's blower with a hopper attachment. The hopper ends in a screw feed-chamber, in which an endless screw, actuated from the axle of the blower, delivers the material in a steady stream to the current of air, which carries it forward in the conveying-pipe to a distance of 300 feet or more. At the Edgerton Coal Company's works, Jermyn, Pennsylvania, a set of the plant is erected near a small coal-breaker, and conveys 350 tons of culm per day to a stack 300 feet away. This blower is 5 ft. 6 in. long, runs at 75 revolutions per minute, and the pipe is 10 inches in diameter, rising to a height of 110 feet. The culm is described as appearing to flow through the pipe without knocking against the walls; and it is stated that plant costing £1200 replaces labour that cost £3 4s. per day; and the running expenses are only 6s. per day for labour and oil. The cost of steam is not given; but against it is placed the credit for doing away with trucks, metals, and other appliances for forming a pile of coal slack by animal labour. The delivery may be changed in any direction by turning the moveable spout of the conveying-pipe.

The Composition of Deposits from Fog.

Professor F. W. Oliver has presented a second report to the Scientific Committee of the Royal Horticultural Society upon the effects of town fog on cultivated plants. It is remarked that a constant source of difficulty in carrying on observations of this character arises from the fact that we are so ignorant of the exact nature of the substances which are present in the air in foggy weather. An enormous number of different substances are discharged into the air in the destructive distillation of coal; but it is only a few of these that can be actually detected and demonstrated to exist in smoke. Most observers have dealt with those substances (like ammonia, carbonic acid, sulphurous and sulphuric acids, &c.) which are relatively easy of detection. Of the organic matters distilled from coal which are present in the air, there is little certain information. A deposit collected from the roofs of Mr. Veitch's orchid-houses at Chelsea contained 14·3 per cent. of organic matter, including hydrocarbons and organic bases. Among the unspecified hydrocarbons are no doubt some of the less volatile tarry substances, and the organic bases will contain bodies of the pyridine series. Many of these bodies are, even in small quantities, injurious to vegetation. The deposit left on the glass roofs of the plant-houses at Chelsea during the severe fogs prevalent during February, 1891, gave the following analyses:—

	Per Cent.
Carbon	39·00
Hydrocarbons	12·30
Organic bases	2·00
Sulphuric acid	4·33
Hydrochloric acid	1·43
Ammonia	1·37
Metallic iron and magnetic oxide	2·63
Other mineral matter, chiefly silica and ferric oxide	31·24

Water not determined.

Mr. W. T. Thiselton-Dyer, of Kew, seems to think that it is the sulphuric acid which is the principal cause of injury to trees and

shrubs, because their parts are permanent, and it is cumulative in its action. Sulphurous acid acts in an entirely different way, and is mostly deleterious to herbaceous and soft-wooded plants. He considers fog is injurious to trees by the actual deposit of a coating of finely-divided carbon; but he admits that the more obscure part of the phenomenon is the part played by the various distillation products present in it.

The Action of High-Pressure Gases upon Metals.

M. Daubrée has been engaged upon a remarkable series of experiments designed to exhibit the physical action of high-pressure gases upon materials exposed to them; the apparatus employed being that used for testing explosives in the French Government service laboratory. A number of curious results were obtained, showing the erosive and compressive power of gas under pressure. As an interesting corollary to his experiments, M. Daubrée points out that leakage from steam-pipes may cut through metal plates. He cites an example in which metal exposed to the escaping vapour from a steam-pipe at a pressure of seven atmospheres was found to be channelled and striated; the marks being similar to those made by a saw or a file. A valve on a steam-pipe, and the seating of a safety-valve, may be attacked in the same way. All groovings in metal attributable to this cause are polished as if by emery. This observation points to the remarkable conclusion that, given sufficiently high pressure and rapid motion, gaseous bodies can polish and striate in a way generally supposed to be confined to the action of solid bodies. This, indeed, is in conformity with the general results of advanced physical research, which show that under sufficient pressure, hard and solid bodies can be made to act as liquids; while soft and even gaseous bodies, if endowed with sufficient force and speed, act like solids.

A Dinner under a Gasholder.—On the occasion of the opening of the new Strandvei works of the Danish Gas Company, situated near Copenhagen, and built to supply the migratory population of the City with cooking gas, a dinner to 120 guests, representing the Local Authorities, Press, &c., was given by the Company's Engineer (Mr. F. D. Marshall) and his colleague (Mr. Cridland) on behalf of the Directors. The banquet-hall used for the occasion was the huge dome under the Intze gasholder erected at these works, which was lighted by a series of Siemens lamps; and the effect was most startling. Several of the guests, however, when they came to realize the situation, and were informed as to the quantity and weight of the volume of water above them, became rather alarmed, and were much relieved when the proceedings terminated. In the evening, upwards of a hundred of the workmen employed in the construction of the works were entertained by the Company at a supper served in the same place.

Tests of Cement.—At the Engineering Congress which has been held in Chicago under the presidency of Mr. C. C. Boney, and at which there was a large attendance of engineers from nearly all parts of the world, two papers dealing with the manufacture and testing of Portland cement came under discussion. One of the speakers was Sir B. Baker, who remarked on the great difference between the cement specifications for two recent enormous English constructions—viz., the Liverpool Water-Works and the Manchester Ship Canal. He said that for the latter a test of only about 300 lbs. was required; and his personal official examination failed to disclose any cracks except hair cracks at angles. The water-works specifications required 80 per cent. higher tests; and the engineers in charge claimed that the concrete was perfectly satisfactory. In testing 2 in. by 2 in. by 12 in. blocks, he had always found the strength of the wall directly proportioned to the tensile strength, and that failure occurred by longitudinal cracks.

Production of Pig Iron in America.—The statistics to hand of the American Iron and Steel Association show that the output of pig iron in the United States for the first six months of the current year was 4,562,918 tons, against 4,387,317 tons in the second half of 1892, and 4,769,683 tons in the first half of that year. There was thus an increase of 175,601 tons, or 4 per cent., compared with the output of the second half of 1892, but a decrease of 206,765 tons, or 4·3 per cent., when compared with the corresponding period of last year. During the past half year, the rate of production in the various States has undergone several important changes. In Pennsylvania, the output has increased from 1,976,673 tons in the second half of 1892 to 2,225,962 tons in the first six months of this year, or 12·6 per cent.; while in Illinois, it has declined from 471,489 tons to 335,771 tons, or 28·4 per cent. Among the more notable increases may be mentioned that of Maryland, amounting to 40,000 tons; Ohio, 24,000 tons; Colorado, 16,000 tons; Kentucky, 14,000 tons; Alabama, 11,000 tons; and Georgia, 10,000 tons. Of decreases, the most important are that of Virginia, 26,000 tons; Tennessee, 14,000 tons; and Michigan, 12,000 tons. The production of Bessemer pig iron in the first half of 1893 amounted to 2,374,890 tons, against 2,189,696 tons and 2,254,345 tons in the second and first halves of 1892; the increase this year being 185,194 tons, or 8·4 per cent., compared with the last six months, and 120,545 tons, or 5·3 per cent., compared with the first six months of last year.

TECHNICAL RECORD.

PROCESSES FOR MANUFACTURING GAS FROM OIL, WITH SPECIAL REFERENCE TO THE PEEBLES PROCESS.

A Lecture delivered by W. Ivison Macadam, F.R.S.E., F.I.C., F.C.S., &c., before the North of Ireland Association of Gas Managers, Aug. 8, 1893.

That a rich illuminating gas could be obtained by the destructive distillation of oils has been known for many years. In the earlier experiments, the ordinary greasy or fatty oils were employed; but the cost of material was so great that the works erected were rapidly closed. The oils used were principally colza or rape oil and train or whale oil. The amount of gas obtained was from 70 to 90 cubic feet per gallon of oil; while the illuminating power ranged from 30 to 70 candles. The cost was rarely below 25s. to 30s. per 1000 cubic feet. These fatty or greasy oils are combinations of the triatomic alcohol, glycerine ($C_3H_5[HO]_3$), with fatty acids, principally palmatic ($C_{16}H_{31}$,HO), stearic ($C_{18}H_{35}$,HO), and oleic ($C_{18}H_{33}$,HO). When destructively distilled, the glycerine passes, to a large extent, into the aldehyde acrolein (C_3H_3O,H); while the fatty acids yield a series of compounds of which the olefines form the greater part. The gas is, therefore, very rich in carbon, and burns with a smoky flame, requiring special burners for its consumption.

Next in time comes "coal oil." This substance is a very complex mixture of carbon and hydrogen compounds. It contains members of the benzol, paraffin, olefine, acetylene, and other series. It is obtained during the purification of ordinary coal tar, and is sometimes used as an illuminating oil. The specific gravity runs from ·840 to ·850 (water=1·000). It contains proportions of the lower members of the benzol, olefine, and paraffin series, which give it a low flashing-point (65° to 70° Fahr.) and a low burning-point (70° to 80° Fahr.). The yield of gas is however high—averaging over 100 cubic feet per gallon of oil, with an illuminating value equal to about 70 standard candles. The gas is rich in members of the olefine series, of which it contains upwards of 45 per cent. It also contains some members of the paraffin series, but only small quantities of the acetylenes. By the newer processes, this substance should give valuable results.

The most important classes of carbon and hydrogen compounds from which gas may be distilled are the petroleums and paraffins. The first of these terms is more strictly applied to certain naturally-formed hydrocarbons found widely distributed over the surface of the globe. The term "paraffin" has been adopted for the materials derived from shales, &c., when these are destructively distilled in closed retorts with or without the admission of steam, and with or without the presence of air.

The natural hydrocarbons, while widely distributed, not only geographically but geologically, are found in large quantities only in a few localities. In Russia, the Baku deposits have been long known; in Burmah, the substance has been worked for centuries; in Japan and China, in Egypt, &c. With the exception of the Russian deposits, all other localities fall into insignificance beside the enormous underground reservoirs discovered in America. The vastness of these American deposits of natural oil may, perhaps, be better understood when I state that the area already proved, by boring and other means, is over 200,000 square miles, and that the production in the year 1882 reached a total of 30,460,000 barrels, or over 1,279,320,000 gallons, of which Pennsylvania alone sent out 1,174,757,220 gallons. Since then the output has decreased somewhat. In the case of Russia, the export is gradually increasing. In 1882 the total number of gallons manufactured was only 200,000,000; in 1884, the amount had risen to 429,400,000 gallons.

The American petroleums consist, chemically, principally of true paraffins (C_nH_{n2+2}), with an admixture of the olefines (C_nH_{n2}), and traces of the benzols (C_nH_{n2-6}). The Russian naphthas, on the other hand, are, to a large extent, made up of olefines, with some benzenes, paraffins, and acetylenes. They contain little or no solid paraffins. In America especially the lighter and more volatile members of the paraffin series (methane and ethane) are found in great quantities as natural gas, and are in admixture with hydrogen and small proportions of carbonic anhydride (CO_2). This natural gas is of high heating value, and is of the greatest importance in works requiring heat of great intensity, such as in the manufacture of steel.

Paraffin oils are obtained by the destructive distillation of shales in closed retorts. The total volatile matter in these shales varies greatly; but it may be stated at from 16 to 28 per cent., with a probable average of 23 per cent. When heated in the retorts, the yield of crude oil is about 12 to 13 per cent. The specific gravity is from about ·860 to ·880 (water=1·000). The total production of crude oil in Scotland is equal to from 60,000,000 to 62,000,000 gallons per annum. There is also produced during the shale distillation from 4 to 6 per cent. of permanent gas. One sample of this gas gave, on analysis, the following results:—

Carbon anhydride	15·40
Hydrogen	34·53
Carbonic oxide	10·72
Methane	4·02
Nitrogen	35·33
	100·00

The gas burns with a pale, almost non-luminous flame; and it is employed for heating the retorts, &c. It gives a hot flame, and is well suited for firing purposes. It is also used for lighting the crude retort-benches; but for this purpose it requires to be carburetted by passage through light naphthas. When the science of oil distilling was less perfectly understood, this gas was purified by means similar to those employed for coal gas, and used for domestic lighting. Now the illuminating agents are almost perfectly separated, and the flame has become non-luminous.

Crude paraffin oil is made up practically chemically, to a large extent, of members of the olefine series, with less proportions of the paraffins and traces of benzols and some acetylenes. It differs from the natural petroleum, which is more largely composed of true paraffins. The names, in fact, would be more descriptive if the term paraffin were confined to the American natural oil. The American petroleum is not so readily broken up into a permanent gas. In some experiments I made with a sample of burning oil of ·799 sp. gr., I obtained 86 cubic feet of 66¼-candle gas per gallon of oil. The decomposition, moreover, was not so complete as with other oils, and consequently when stored the gas lost a greater proportion of its luminosity by condensation.

Crude shale oil may be distilled into permanent gas with good results. But, as the material is either solid or semi-solid, it is very difficult to work; as even when heated it is liable to "set" in the small pipes leading to the retorts. In some tests made with an oil of ·850 sp. gr., we obtained from a gallon 98½ cubic feet of permanent gas of 50-candle power. The crude oil contains impurities, from which it may be separated by distillation in a current of steam; and the resulting oil gives much better results when made into gas. During the oil distillation, the gravity is reduced to close upon ·800; and a gallon of oil will then yield over 100 cubic feet of 70-candle gas.

Such oils, however, are not well suited for gas making with the older forms of apparatus; as, containing the light volatile hydrocarbons, they are highly inflammable, and are dangerous to store. At the same time they contain the valuable "burning" oils, the solid paraffins, and the heavy lubricating oils. These bodies are generally extracted from the shale oil before the residue is employed for gas making. The process varies in different works, but generally consists first in distillation with steam, then in treatment with sulphuric acid, and afterwards with soda to remove certain nitrogenous alkaloidal bodies belonging to the pyridine series, &c., and tar acids of the carbolic series, &c. The oil is then again distilled, but the distillate is "cut" into two portions—(*a*) A light oil, containing naphtha, burning oil, and intermediate oils, with some of the softer solid paraffins; and (*b*) a heavy oil, from which is extracted intermediate and lubricating oils, and solid paraffins of the higher fusing-points. These various fractions are extracted after repeated treatment with sulphuric acid and soda, followed by distillation—this latter aided by a current of steam. The products then are: (1) Light oils or naphthas (·750 sp. gr.), (2) burning oils (·805 to ·830 sp. gr.), (3) intermediate oils (·840 to ·870 sp. gr.), (4) lubricating oils (·870 to ·890 sp. gr.), and (5) solid paraffin.

The light oils or naphthas may be distilled into permanent gas; but they are more usefully employed as solvents for india-rubber, as turpentine substitute for paints, for carburetting (mechanically) water gas, &c. The burning oils give a good yield of illuminating gas. An oil of ·815 sp. gr. gave us 100 cubic feet per gallon of gas of 63-candle power; and a second oil of ·830 sp. gr. yielded over 100 cubic feet of 50-candle power gas per gallon of oil. The solid paraffins are too valuable to be economically distilled, even were the mechanical difficulty of their solid condition overcome. The oil from which the solid paraffins of higher fusing-points have been extracted is "green" oil, and may be readily converted into gas. A sample of ·884 oil gave 102 cubic feet of gas, having an illuminating value of 53-candle power. This oil, however, still contains some of the softer solid paraffins, which can be removed by freezing, when the liquid becomes "blue" oil. This class of oil is also used for gas making, with good results. The average result obtained by us may be stated at 128 cubic feet of gas of 54-candle power per gallon of oil. After further purification and distillation, this oil becomes "lubricating" oil of various gravities and "body." A lubricating oil of ·873 sp. gr. readily gave 102 cubic feet of 61-candle power gas; while a heavy lubricating oil, of ·894 sp. gr., gave 94 cubic feet of 57-candle gas per gallon of oil distilled.

It is, however, with the intermediate oils that the present, as well as the future, of oil-gas making must remain. These oils, after the most careful fractionation and treatment, are too heavy to burn in ordinary lamps, as their viscosity is too high to admit of their ascending the wick by their own capillarity. They may, however, be burned to advantage in specially constructed lamps. They are also too light in body for use as lubricants, and are therefore almost waste substances. Before the days of oil gas, these oils were submitted to the process of "cracking;" and in America this is still carried out. The method simply depends upon the fact that the higher members of the olefine series, when subjected to a prolonged application of radiant heat at or near their distillation-point, are coverted partly into lower members of the same series, and partly into marsh gas (methane). The paraffins present are almost entirely converted into lower members of the olefine series. By this means the gravity is lowered, and the viscosity destroyed. After a treatment with acid and soda, and a distillation, they may be used for burning in ordinary paraffin-lamps. They, however, never give satisfaction, as, being so largely composed of olefines, they form combinations with the vitriol used in the treatment; and, on being burned, the wicks become loaded with sulphur compounds, and are charred. The products of combustion also contain much sulphurous anhydride (SO_2). Since the demand for "gas oil" has increased, cracking, in this country at least, has entirely disappeared, and the intermediate oils have now a distinct value in themselves. The flashing-point of the intermediate oils runs from 230° to 250° Fahr., and the firing-point is over 280° Fahr. There is, therefore, no danger from volatile inflammable vapours lodging in the store-tanks. The yield of gas per gallon of oil is about 94 cubic feet; and the quality is close on 60 candles. The gas consists of about 35 to 37 per cent. of olefines—with methane, hydrogen, and some benzenes and acetylenes.

Until the last few years, an oil known as "gas oil" was on the market. This product was obtained by distilling the mixed tars formed by the addition of the acid and soda during the various stages of refining the paraffin oils. The gas oil was an amber-coloured liquid, and contained leucolines and pyridines from the soda-tar and hydrocarbons especially rich in carbon. It burned with a very smoky, sooty flame, and gave a gas rich in acetylenes. The manufacturers now find that it is more economical to burn the tars as fuel below the boilers and stills. It is injected by a current of steam, and is a valuable fuel.

The gas made from oil is employed either directly as an illuminant, or else to enrich other gas of a poorer quality. In the processes I propose to describe, I have purposely left out those forms of apparatus which enrich poor illuminating gas by passing it directly through highly volatile hydrocarbons. Such processes are purely mechanical, and result simply in the suspension of the highly volatile liquid in a large body of a permanent gas. The patentees of oil-gas apparatus have invariably attempted to distil the oil by one operation into gas; and their processes require considerable heat on the retorts. As bye-products, they obtain a condensable tar of benzol-naphthalene character and more or less carbon (*not coke*). The Peebles process, as I propose to show, makes no such claim; and the only bye-product is a hard and valuable coke.

Of the first class, I will describe the processes of (*a*) Pintsch, (*b*) Keith, (*c*) Alexander and Paterson (Kirkintilloch), and (*d*) Brooks; and latterly I will take up the Peebles process, and show how it differs from the other methods.

Pintsch's apparatus is especially constructed to work burning and lubricating oils, or oils of the class intermediate between burning and lubricating. It is not at all adapted for crude or other oils which set to solid or semi-solid masses at ordinary temperatures. The retorts are Ω-shaped, and are worked in pairs. The higher retort has a tray placed in it, on which is received the oil to be distilled. The intention of the tray is to keep the cold oil from falling on the hot retort surface, and probably damaging it. Besides this, however, it acts as a vaporizer and as a collector of much of the carbon deposited from the oil, and thus aids in cleaning the retort. The oil, having become vaporized and partially broken up or decomposed in this upper retort, passes by a neck-piece, situated at the back of the higher retort, downwards to the lower retort, where, meeting with a higher temperature, the decomposition into permanent gas is fully accomplished. The gas then passes to the tar-pit, where some dark liquid is deposited, and thence to condensers where it is cooled, and to a washer and purifier, from which it goes to the gasholder. The condensers have nothing very novel about them; but the washer deserves description. It consists of a cylindrical column, in which is suspended an iron tray with a corrugated under surface, so constructed as to spread the gas and compel it to come in contact with the water. The gas passes by perforations in the side of the tray to the upper gas chamber, and thence by a pipe to the purifier. This latter is of the usual pattern, except that the iron tray gives place to a basket-work square, on which is laid the mixture of oxide of iron and sawdust intended to remove any sulphur compounds that may be in the gas.

The quantity of gas produced by this apparatus may run as high as 90 cubic feet per gallon of oil; but, in ordinary working, from 80 to 85 cubic feet is looked upon as a fair return. For each 1000 cubic feet of gas made, about 4 gallons of tar are obtained. This tar has not been very fully investigated; but in some experiments I made, I was successful in isolating several members of the benzene series, some olefines and acetylenes, and a considerable proportion of naphthalene. It is said to find a market on the Continent; but, so far as my own experience goes, it is generally consumed as a fuel below the steam-boiler employed to compress the gas. It yields a good heat, and is well suited for the purpose. At the same time it appears to be a great pity that so much valuable material should be lost. Generally, the Pintsch gas is employed for the lighting of railway carriages, floating buoys, lighthouses, lightships, &c. In such cases, the gas is compressed by powerful pumps into steel cylinders under a pressure of about 13 atmospheres. The cylinders then supply the smaller portable cylinders, which, in the case of railway carriages, are generally fixed below the flooring.

On the Thames and Clyde, as well as on several other home rivers, Messrs. Pintsch have supplied floating buoys. These are generally spherical in form, with the lower part removed,

and an inverted saucer-shaped bottom riveted on. This form of bottom is found the best to overcome the force of a current. The sphere is surmounted by an iron superstructure, holding the lamp and lense. In the newer form, the gas receiver is an independent receptacle placed inside the outer sphere. By this means the risk of damage by collision is, to a great extent, overcome. These gas-buoys are usually charged at a pressure of from 5 to 10 atmospheres; have a consumption of 0·75 cubic foot per hour; give a flame with a candle power equal to about 5 standard candles, but which, by means of lenses, is increased to an apparent 17 to 20 candles; and burn night and day for fully 100 days without re-charging. The buoys are re-charged as nearly as possible each two months; but, having a much larger storeage power, they can be safely left for a much longer period. At first, some difficulty was found in keeping the lights burning; but, by means of a very simple form of concussion-box, this difficulty has been completely overcome, and I am informed by the Inspector of the Clyde Navigation Trust that such a thing as a light becoming extinguished is unknown. Besides these buoys, the Clyde Navigation Trust have several light-towers, lighthouses, &c., working with the gas.

As showing the ease of working and saving of cost, I may instance the Garmoyle lightship, which previously required the regular attendance of a man and his wife, with an outlay for wages, oil, &c., of nearly £150 per annum. Now there is no attendant on board; and the gas is charged into two steel cylinders once each two months. The supply of gas is much in excess of the two months' requirements; and on one occasion the gas did not need replenishing till after fully three months, and then it was not exhausted. The cost for gas is about £12 to £16 per annum. The light burns continuously, and requires little or no attention.

All the Clyde installations are fed from one gas-works situated at Port Glasgow; the gas being carried to the various points by a specially-constructed screw steamer, the *Torch*. This beautiful little vessel carries two steel cylinders, which are kept fully charged; and the boat is always ready to go to any point should an accident occur. So far, only one instance has taken place in which her services have been necessary.

The Pintsch gas is also used for gas-engines, at Toward Point and Little Cumbrae. The apparatus at Toward Point is of 1-horse power, and works a fog bell; the Little Cumbrae gas-engine is of 6-horse power, and is used to blow the siren. During the compression of the gas, a certain amount of loss is sustained by the condensation of part of the illuminants. This condensation is equal to about a gallon of hydrocarbon per 1000 cubic feet of gas; and the loss of illuminating power is nearly 20 per cent. The initial candle power of the gas is equal to about 50 standard candles for each 5 cubic feet burned. The products under this system may shortly be stated to be, for 12½ gallons of oil, 1000 cubic feet of gas, 4 gallons of tar, and 1 gallon of hydrocarbon. The hydrocarbon consists largely of benzenes.

Many statistics as to the cost of the gas have been published by the various companies using this apparatus. Two of the largest railway companies put the cost, after deducting residuals, but exclusive of distribution or interest on plant, at 6s. per 1000 feet, and their make at from 78 to 80 feet per gallon of oil.

Keith's apparatus differs in the form of retort from that previously described. It consists in a single through retort of ⌂ shape, but having in the centre, midway between the back and front, a depression. The oil is fed in at the front; and the gas passes out at the back of the retort. This class of apparatus has been adopted by the Northern Lights Commissioners for installations at Ailsa Craig and Langness (Isle of Man). In both cases the gas is used for engines to blow sirens, and in the first case also for illumination. I have had no practical experience with this apparatus; but my father (Dr. Stevenson Macadam), under instructions from the Northern Lights Commissioners, went very fully into the merits of both Keith's and Pintsch's apparatus. The following is a summary of the results he obtained:—

Keith's Apparatus.

	No. 1.		No. 2.
Gas per gallon of oil .	85·05 cubic feet.	..	84·82 cubic feet.
Illuminating value . .	63·25 candles.	..	59·52 candles.

Pintsch's Apparatus.

Gas per gallon of oil .	90·70 cubic feet.	..	103·36 cubic feet.
Illuminating value . .	62·50 candles.	..	59·15 candles.

I am not aware of the quantity of tar produced in Keith's apparatus, nor how far the gas may be compressed, nor of the loss of illuminating value during compression. Before employing the gas for gas-engines, Mr. Keith dilutes it with one-half its volume of atmospheric air. The apparatus used is novel and efficient. The cost of the gas is stated to be 5s. 9d. per 1000 cubic feet; but this sum does not include carriage of oil and coal, wear and tear of retorts, apparatus, &c., nor the cost of labour or distribution.

The Alexander and Paterson apparatus was intended at first for the production of gas from burning oil (·815 sp. gr.). Worked with this class of oil, it readily gave 100 cubic feet of 63-candle gas per gallon. Later, however, I recommended the use of intermediate oils, as gas can be produced from these at a much cheaper rate, owing to the smaller cost of material. In tests made with this apparatus and intermediate oils of ·864 sp. gr., 94 cubic feet of a 56-candle gas were easily obtained. The apparatus is simple, consisting of a retort, the door of which is perforated to allow of the introduction of tubes. The oil is passed by these tubes to the back of the retort, being largely vaporized *en route;* it then comes in contact with the heated sides of the retort, and is permanently broken up into a gas, which is drawn from the front of the retort. After condensation in upright pipes, the gas is passed direct to the holder. Working with high-class intermediate oils well purified, the want of purifiers to remove sulphur compounds is not felt. The total amount of sulphur in the shale is not usually more than 1½ per cent., and of this only 0·028 per cent. can be traced to the crude oil. During the process of refining, most of this disappears. Where desired, however, the addition of a purifier is readily introduced. The apparatus is simple, easily worked, and especially suited for works or gentlemen's houses. It is working in several places, and is giving satisfaction. Where a pure oil gas of high illuminating power is desired, and where this is not afterwards to be mixed with coal gas, the apparatus is one of the best I know.

The Brooks patent differs from all the foregoing, in so far as it is specially built for crude oils. The retort is most curiously shaped, in a zig-zag fashion; and the special advantage of this form is said to lie in the greater contact of the oil with the heated sides of the retort. The process also differs from the others in so far as there is introduced a current of steam, which is broken up along with the oil; thus increasing the quantity of the gas, although lowering its lighting quality. The process is largely in use in America; and it gives successful results. It is also patented in this country; but I am not aware of its being worked here. The peculiar form of retort is distinctly against its adoption; and I can see no reason for the form. Experience has clearly demonstrated that the process of gas making from oil consists, chemically, in the degradation of higher carbon and hydrogen compounds to lower forms, accompanied by the production of bodies rich in carbon and free hydrogen, &c. These processes are best carried out by heat radiated from a large surface, and not by direct contact with the metal. Direct contact leads to the production of much free hydrogen, and the deposition of free carbon in the retorts, with consequent loss of illuminating power. This has been fully brought out in experiments made by my father so long ago as 1872, with an apparatus packed with coke, and by myself in tests made with thin tubes. Further, the temperature required to break up oils into permanent gas of high illuminating value is an orange red; while a white heat increases greatly the gas produced, but practically destroys the illuminating power. With small tubes, or zig-zag apparatus, it is almost impossible to regulate the temperature.

The Peebles process differs essentially from any of the other processes mentioned; for while these act by one direct heat action, the Peebles process, by means of a lower heat and constant return circulation of the condensable products, only gives a partial breaking up at each circulation. In the newer forms of apparatus, as at Galashiels,* the coal gas and oil-gas retorts are back to back; and the waste heat of the former serves to heat the latter. The retorts need not, however, be so placed, for at Peebles the coal gas and oil gas are made in the same oven; but for economical working the Galashiels setting should be best. The coal-gas retorts are of the usual ⌂ shape and size, and are set in the ordinary way, while the best form of retort for the oil gas is cylindrical. The Galashiels retorts are 9 feet long and 27 inches internal bore; and they are laid with a backward inclination. From the front of the retort, there is an ordinary ascension, bridge, and dip pipe to the hydraulic main. The condensers are nearly horizontal, with a slight upward tendency, and lead to a scrubber, on the principle adopted regularly in shale-oil works. The trays in the scrubber are fed with oil from a cistern attached to the upper part of the apparatus. From the scrubber the gas passes to the ordinary dry purifiers, where it meets with the coal gas; and the mixed gases then go to the holder in the usual manner. The oil for the retort is obtained from what is called the compensating-tank. In this tank the overflow from the hydraulic main, the liquids from the condensers, and the fresh oil are intermingled, with the result that a perfectly liquid substance is maintained throughout the whole of the working. Moreover, the apparatus, being of considerable size, acts as a settling-tank, in which any solid carbonaceous matter is removed. The oil passes from the compensating-tank by means of a pipe, with a regulating-valve, to the ascension-pipe, where the introduction of the liquid oil tends to wash the ascending gas, and remove any suspended carbonaceous particles. By this circulation method, liquid residuals are avoided; and the residue left in the retort, when it is coked down, is a dense and very pure carbon, with less than 0·5 per cent. of ash, and readily burned. For this solid residue, 20s. per ton has been regularly obtained at Peebles. It yields a smokeless flame of great heat-intensity. The gas yield by this method runs, with "blue" oils, from about 85 to 86 cubic feet per gallon; and the illuminating value when the gas is burned by itself is about 59 candles. When burned in admixture with

* The lecturer exhibited the diagram of this plant, as reproduced in the JOURNAL for the 8th inst., p. 265.

poorer illuminating gas, the value is much greater. A month's actual working yielded—

Coal gas . . .	1,217,600	cubic feet of	18·00-candle power.	
Oil gas . . .	253,400	"	"	
Total gases . .	1,471,000	"	"	30·51 "

Coal gas . . . . 1,217,600 ÷ 5 = 243,530 × 18·00 = 4,383,360 candles,
Total gas . . . . 1,471,000 ÷ 5 = 294,200 × 30·51 = 8,976,042 "

Therefore the candle power from 253,400 cubic feet of oil gas= 4,592,682 candles, which, divided by the make (253,400 cubic feet) = 18·12 candles per cubic foot, and multiplied by 5 = 90·60-candle power as the true illuminating value of the oil gas as an enricher. This gain in illuminating value by mixing is equal to 53·74 per cent. To explain this gain, we need to consider several points. When any complex body is subjected to a sufficient amount of heat, it is resolved into its elementary constituents, or into more simple bodies. If the heat applied be great enough, the ultimate particles will be driven so far apart that chemical union is rendered impossible. If, on the other hand, the heat is less, only partial decomposition results; and the substances produced are still compounds, although less complex than the original substances acted upon. If the oil be subjected to the highly-heated surface of a retort, the decomposition is almost complete—methane is formed, any oxygen goes into carbon monoxide or dioxide, hydrogen is set free, and all excess carbon is deposited as free carbon. If, on the other hand, the heat from the furnace is compelled to pass through the sides of the retort, and to be communicated to the atmosphere of the retort, which, in its turn, radiates the heat on the volatilized oil, the resulting decomposition will not be so complete, and the gases left will be more complete in nature, and more highly carbonaceous. To produce light from carbonaceous gases, the carbon requires to be set free, and then raised to a considerable temperature, so as to become incandescent. The incandescence may lead only to a glow, or, as the temperature rises, to a more decided light. If in the gas-flame the heat (in this case derived from the burning of the hydrogen, carbonic monoxide, &c.) is sufficient to produce a temperature great enough, the maximum of light will result. If these gases are too small in amount, then the flame becomes smoky, and the light less. In oil gas the last condition holds good; and the balance is brought about by the admixture with a poorly carbonaceous gas containing much hydrogen, and which on burning gives sufficient heat to render the excess carbon of the oil gas incandescent. In other words, the excess of carbon in the oil gas is rendered incandescent by the excess of the heat-producing bodies in the poorer gas; and the result is an excess of light over that obtained from either gas alone. The 18-candle splint gas becomes valuable as an enricher on account of the excessive heat of its combustion; and the 59-candle power oil gas enriches on account of its excessive carbon. Both gases are required to give the desired result, and both therefore have a claim on the excess of light obtained from admixture.

I have seen the Peebles process on several occasions, and can testify to the ease of working and regularity of product; and I feel sure that the process has a great future.

The Life of Incandescent Electric Lamps.—As the result of a large number of experiments made by the firm of Messrs. Siemens and Halske, of Berlin, the following is shown to be the duration of 16-candle power incandescent electric lamps: Lamps of 1·5 watts per candle, 45 hours; 2 watts, 200 hours; 2·5 watts, 450 hours; 3 and 3·5 watts, 1000 hours.

The Candle Power of Arc Lamps.—In order to overcome the difficulty as to the nominal and real candle power of arc lamps, the Electric Congress at Chicago will consider the following resolution: "The term 2000-candle power is to mean an arc produced by 10 ampères and 45 volts potential difference between the carbons, or a 450-watt arc. The candle power of arcs produced by currents of more or less ampères, or more or fewer volts difference of potential, to be rated proportionally."

Municipal Electric Lighting in America.—According to the American Correspondent of the *Electrician*, there seems to be a decided tendency at present towards towns and cities undertaking the erection and operation of street electric lighting plants. This is particularly marked in the more intelligent districts of the United States, and in some of the larger cities in the government of which Americans have yet a voice. He says that in most of the large cities, however, there is little chance of municipal plants being erected, owing to the certainty that political corruption would result.

The Transmission of Power.—An important scheme for the transmission of power is now being considered in Switzerland. It is proposed to dam the River Reuse, and convey the water to a storeage and distributing reservoir having a capacity of 19 million gallons, situated at Combe Garrot. From here the water is to be distributed to the communities of Neuchâtel, Loche, and La Chaux-de-Fonds. The head available will be about 300 feet, and the conduits will have a capacity of 177 cubic feet per second, though the flow of the river varies between 100 and 60 cubic feet per second only. The power will be distributed from the turbine stations by electricity; the distances being from 7½ to 11 miles.

THE HEAT OF COMBUSTION OF COAL GAS IN RELATION TO ITS ILLUMINATING POWER.

At the recent Meeting of the Société Technique du Gaz en France, a paper on the above subject was read by Mons. P. Aguitton, Engineer of the Marseilles Gas-Works. The author also dealt with it in a communication presented to the Académie des Sciences, which formed the basis of the article by Mr. B. H. Thwaite contained in the last number of the JOURNAL. The first-named paper will appear in due course in the Society's Transactions. In the meantime, we have been favoured with a copy, from which the following abstract translation has been prepared.

The increasing application of coal gas for heating, motive power, and more especially for incandescent lighting, has drawn attention to the little-studied subject of its heat of combustion. From analytical data, MM. Aimé Witz, Mahler, and Bueb have calculated (on a scarcely legitimate basis) the heat of combustion as being 5250, 5600, and 5115 calories per cubic metre, under normal conditions of temperature and pressure. It must be quite evident the heat of combustion will vary with the richness of the gas; and the present investigation was undertaken to ascertain the relation between the heat of combustion and the illuminating power of coal gas as ordinarily employed.

The gas for examination was prepared in an experimental apparatus—the rich kind being either produced from cannel coal, or being the early product of the distillation of ordinary coal; the poor being the later product of the same process. No common gas or air enriched by hydrocarbons was used in the experiments. The illuminating power was ascertained by a Dumas and Regnault photometer from the number of litres of gas required to be consumed to give a light equal to one Carcel-hour, or by testing the gas burning at the rate of 100 litres per hour (instead of 141 litres per hour according to the English custom), against the decimally graduated candles adopted by the "International Congress of 1889," of which 9·6 are equivalent to a Carcel. The heat of combustion was determined by the Mahler bomb, which was selected for the following reasons: The calorimetric bomb, as used by M. Aimé Witz in his experiments, allowed only a very small volume of gas to be operated upon, on account of the large quantity of air admitted to form an explosive mixture; and slight differences in temperature greatly affected the result. A large volume of gas was employed by M. Bueb; but his results were vitiated by all the errors inherent in a continuous method. M. Mahler's modification of Berthelot and Vieille's calorimetric bomb is more serviceable. It is an ordinary calorimeter with helicoidal agitator and an iron or soft-steel cylinder, in which the explosion is carried out, provided with an iron wire, which is heated by the passage of an electric current, in order to ignite the gaseous mixture. The capacity of the cylinder is 573 cubic centimetres; and this volume is operated on, as the oxygen for the combustion is forced in, to a pressure of five atmospheres, from a cylinder of compressed oxygen. The thermometers have sufficiently open scales to permit of reading to 1-50th of a degree with the naked eye. An experiment can be carried out in about twenty minutes.

With this apparatus, gas of a hundred different qualities was tested, and the heat of combustion of a cubic metre of dry gas calculated—the vapour of water being considered as condensed. These experimental results were plotted out graphically; the heats of combustion as the ordinates, and the illuminating power in decimally graduated candles as the abscissæ. On uniting the points, the curve is found to be practically a straight line represented by the equation $C = I \times 352{\cdot}6 + 2280$, where C is the heat of combustion of a cubic metre of gas, and I is the illuminating power in decimally graduated candles. If the illuminating power is stated in English standard candles, I must be divided by 1·41 in the above formula. From this formula the author compiled the table given in the article by Mr. Thwaite already alluded to. It shows that a cubic metre of gas of a photometric value of 9·14 candles under normal conditions, and the vapour produced by combustion condensed, has, at constant volume, a calorific power of 5503 calories. From 4043 calories given out by gas of 5 decimally graduated candles to 7569 calories from 15-candle gas, is a variation of about 3500 calories for a difference of 10 candles. It will be clear how great an error is committed if 5500 calories are taken as the heat of combustion of any gas whatsoever. It will be further seen that this heat is closely related to the illuminating power of a gas, which confirms the conclusion of M. Sainte-Claire Deville that in coal gas the proportion of hydrogen and methane varies very little; that the benzene vapour is constant; but that the hydrocarbons condensed at − 70° C. (such as ethylene, propylene, and acetylene) vary in amount, and determine the illuminating power. If the proportion of hydrogen to methane is variable, the illuminating power is unaltered; but, owing to the heat of combustion of methane being greater than that of hydrogen, the calorific power may be greatly affected. It is proved, however, that the calorific value of coal gas is of the same order as the illuminating power; and, if known exactly, it forms at least as good a criterion of the latter as determinations with candles of doubtfully

constant light-giving power. Gas is at present employed partly for lighting and partly for heating purposes; but a time may come when it will be used almost exclusively in virtue of its heat of combustion. Under the circumstances, it is reasonable to inquire why an inexact system of photometry is retained in place of one which shows, in addition to illuminating power, the value of the gas for heating and motive purposes.

The next subject for consideration is the influence of the heat of combustion of coal gas on the lighting effect of the Welsbach burner. A second series of experiments was carried out with gas of different qualities; the heat of combustion being in each case ascertained by means of the Mahler calorimeter, and the light produced by consumption with a Welsbach burner by means of a Foucault photometer. The following table shows the results of the investigation:—

Heat of Combustion of the Gas. Calories.	Lighting Power in Decimally Graduated Candles from 100 Litres of Gas.	Number of Calories for a Photometric Value of 10 Candles.
7529	77·09	97·7
6523	74·40	87·6
5897	70·65	83·5
5582	63·36	88·1
5474	61·73	88·6
5355	60·09	89·1
5068	50·11	101·1
4941	45·50	108·6
4741	40·89	115·9
2175 (impure H_2)	16·41	132·5

It will be seen that the photometric value of the gas rises with its heat of combustion. On plotting out graphically, the curve representing the increase of lighting value for increase of heating power rises regularly from 4800 to 5900 calories; but after that it does not go farther with increasing heat of combustion. This shows that the burner requires modification, either by making provision for the admission of more air, or by better mingling of the gas and air, for the economical consumption of rich gas. For poor gases, the curve becomes nearly a horizontal line. All the experiments were made with a No. 2 burner, provided with a regulated air supply. A comparison of the above table with the one already given, shows that, for gas of the same heating power, the Welsbach burner has a photometric value about seven times that of the Bengel burner with the same consumption of gas.

By dividing the number of calories obtained from 100 litres of gas by the illuminating power, there is found the duty of the burner—that is to say, the number of calories required to give a photometric value of 10 candles. This is not constant; and, on laying out graphically, the curve is found to pass through a minimum at 83 calories, corresponding to a combustion of 5800 calories, or a gas of 95 litres value by the Dumas and Regnault photometer. This interesting result indicates that, assuming equality of price per calorie, gas of medium quality gives the maximum economy in the Welsbach burner. This minimum of 8·3 calories per candle approaches the efficiency of the incandescent electric light—one calorie corresponding to 9·6 watts per candle; while an incandescent electric lamp giving 16 candles at 100 volts for a current of 0·5 ampère requires 3·5 watts per candle. The Bengel burner gives a yield corresponding to 68 watts per candle, which shows how much more nearly the Welsbach burner approaches the electric light in duty.

There is one more point yet to be cleared up. An expert chemist recently stated that the light-intensity of the Welsbach burner was independent of the quality of the gas consumed. This he demonstrated by using a certain gas, and then burning some of the same gas after the removal of its hydrocarbons by passing it over coke impregnated with colza oil. The illuminating power was said to be the same; hence he concluded that, in the incandescent system, poor gas gave the same lighting effect as rich. He even stated that, as the proportion of illuminating hydrocarbon was small, the calorific value of the gas should not be appreciably altered. This hypothesis has been proved above to be false; but the experiments have been repeated, with the addition of the determination of the calorific value of the gas. The results are as follows:—

	Gas as Manufactured	Decarburetted Gas.
Photometric value by the Dumas and Regnault apparatus	107·9 litres	143 litres
Light intensity of 100 litres in the Welsbach burner	5·70 Carcels	5·54 Carcels
Heat of combustion of the gas	5355 calories	5200 calories

It is clear that the heat of combustion corresponds closely with the intensity of light in the Welsbach burner, but that it does not accord with the ordinary photometric value; and consequently the law just enunciated on the correspondence of the heat of combustion with the illuminating power of a gas, appears inexact. The matter admits of easy explanation. In its passage through the colza oil, the gas loses its hydrocarbons, but at the same time carries over mechanically some of the oil. The mixture is not sufficiently intimate for the traces of oil to be consumed in the Bengel burner; and the light produced is simply that of decarburetted gas. But, in the Welsbach burner, the colza oil, though not gasified, is arrested by the earthy film, and burns; thus producing the same effect as an enriched gas. Similarly, the heat of combustion is that of the gas *plus* the oil sprayed over by it. The correctness of this explanation was proved by passing a quantity of the decarburetted gas through cotton wool, which retained some of the oil carried over, as was demonstrated by its recovery by extraction with carbon bisulphide.

In addition to its usefulness for ascertaining the quality of gas, the Mahler calorimeter has certain other applications in gas-works. Instead of analyzing heating gases by means of the Bunte burette, and calculating their calorific power, the result may be attained more easily by the calorimeter. Thus, taking two samples of gas, an analysis with the Bunte burette gave the following results:—

	No. 1.		No. 2.
Carbonic acid	8·4		6·0
Oxygen	—		—
Carbonic oxide	18·4	24·1	27·0 33·2
Hydrogen	5·7		6·2

The heat of combustion, calculated according to Dulong's law, is 739 calories for sample No. 1, and 1014 calories for sample No. 2. Rapid experiments with the Mahler bomb gave 730 and 1031 calories respectively. This instrument also serves for chemical investigations, such as for the determination of sulphur in coal, coke, or even gas. It therefore opens out a new and extensive field for research in connection with the gas industry.

Presentation to Mr. R. W. Moore.—Last Friday, an interesting ceremony took place at the offices of The Gaslight and Coke Company in the Horseferry Road, when Mr. Robert Washington Moore was, on his approaching marriage, presented by his brother officers with a valuable and handsome clock, with bronzes to match. The presentation was made by the chief of his department, who, in the course of a short but admirable speech, remarked on the singularly appropriate nature of the present to one engaged in an office where punctuality was regarded as a *sine quâ non*. Mr. Moore returned thanks in a few well-chosen words; and, after general congratulatory handshakings, the pleasant incident terminated.

The Coke-Stove Competition in Brussels.—Our readers may remember that, early in the present year, we intimated that a project was on foot for having a competition of appliances for heating by coke, to be held in Brussels under the auspices of the Belgian Association of Gas Managers. Several makers sent in stoves; and the jury have made the awards in the various classes. It was understood that the successful appliances should be on view in some central position in Brussels. This has been done; and the exhibition was to be opened yesterday morning, in the Teachers' Normal School on the Boulevard du Hainaut. The following is a list of the awards: Class A (open stoves and fireplaces), silver medal to M. M. Dequenne et Cie., of Brussels. Class B (close stoves for apartments), gold medals to M. Louis Courtot, of Dôle; M. Peyre-Gough, of Paris; and M. Nestor Martin, of Brussels. Class C (close stoves for heating large areas), gold medals to M. Charles Bourdon, of Paris, and M. Peyre-Gough; silver medal to MM. Dequenne et Cie. Class D (hot-air stoves), gold medals to M. Charles Bourdon and M. Detr ux, of Nivelles; bronze medal to M. Degrelle, of Liège. Class F (kitchen stoves for coke and gas), two gold medals to M. Nestor Martin, and one to MM. Dequenne et Cie. Class H (special stoves for use with water or steam heating apparatus), gold and bronze medals to M. Detraux; silver medal to M. Defontaine, of Brussels. Class I (industrial appliances), bronze medal to M. Detraux, and to M. Bréart, of Brussels.

Coal and Iron Production in Belgium.—The production of coal in Belgium in the first half of the present year amounted to 9,428,842 tons, as compared with 9,736,185 tons in the corresponding period of 1892; showing a decrease of 307,343 tons this year. The total of 9,428,842 tons, representing the production in the first half of this year, was made up as follows: First division, 6,833,635 tons; second division, 2,595,207 tons. The first division comprises the Couchant de Mons and the Centre and Charleroi districts. The second division comprises the Luxembourg and the Namur and Liége districts. The stocks of coal in hand at the close of June this year were 1,143,489 tons, as compared with 1,201,333 tons at the close of June, 1892; showing a decrease of 57,844 tons this year. The production of pig iron in Belgium in the first half of the current year was 370,364 tons, as compared with 386,513 tons in the corresponding period of 1892; showing a decrease of 16,149 tons. In the total of 370,364 tons, representing the production of Belgian pig to June 30 last, casting pig figured for 37,456 tons, refining pig for 221,622 tons, and steel pig for 111,286 tons. The production of casting pig increased in the first half of this year to the extent of 2875 tons; and that of steel pig, to the extent of 1374 tons. On the other hand, the production of refining pig fell off by 20,398 tons. Iron was made in Belgium in the first half of this year to the amount of 248,207 tons, as compared with 264,785 tons in the corresponding period of 1892; showing a drop of 16,578 tons this year. In the 248,207 tons representing the iron made in Belgium to June 30 last, rails and plates figured for 62,132 tons, and miscellaneous iron for 186,075 tons. The quantity of steel made in Belgium in the first half of the present year was 222,641 tons, as compared with 240,652 tons in the corresponding period of 1892; showing a decrease of 18,011 tons. In the 222,641 tons, representing the production of steel in Belgium in the first six months of 1893, cast steel and ingots figured for 123,097 tons, and forged steel rails, plates, &c., for 99,544 tons.

AUTOMATIC APPLIANCES FOR SMALL GAS-WORKS.

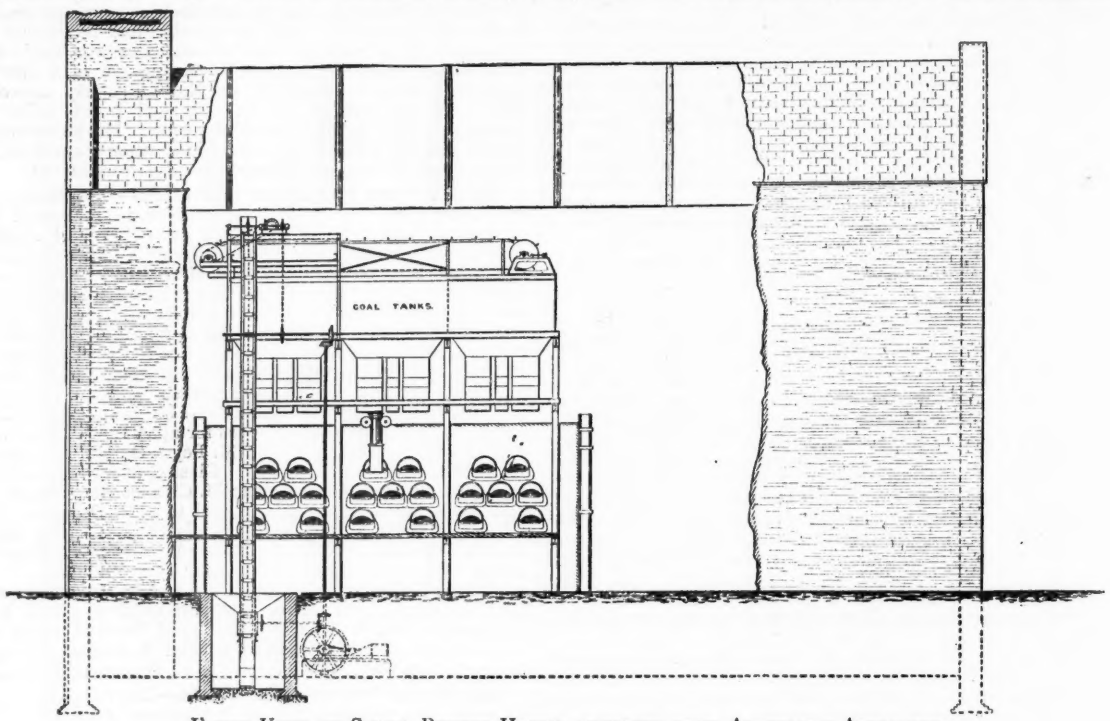
A Paper presented by Mr. Gilbert Little to the North British Association of Gas Managers at Dundee, July 27, 1893.

Carlyle, who defined the highest point of mechanical genius as "the power to bring together two forces which fit each other and give birth to a third," characterized the two decades, 1850-1870, as the mechanical age—"the age of labour-saving machinery in every form; an age which, with its whole undivided might, practises the great art of adapting means to ends. For the most intricate, as well as for the simplest operations, the same abbreviating processes are in readiness; there is no end to the triumphs of self-acting machinery." There is a true Carlylean flow of exaggeration in the foregoing quotation. We are a good distance yet from the perfection in labour-saving machinery depicted by the "Sage of Chelsea," particularly in gas-works; but greater activity in this direction may be looked for, as in the setting-out and management of new, or in the improvement of old, retort-houses. The object now chiefly kept in view (under the disadvantages of an almost daily disturbed labour market) is the need of automatic appliances to manipulate the coal and coke. This has been particularly noticeable in recent extensions and improvements in large gas-works, the engineers and managers of which appear to be fully alive to the fact that no investment yields so high a return as machinery skilfully employed. A few of the more enterprising chiefs of large gas-works are evidently proceeding on the principle of the old Lancashire saying, that it is always worth investing £1000 to save the annual cost of one man's labour.

Since I prepared the paper on "Transit of Materials in Gas-Works," for your meeting at Perth in 1890, my Company has equipped a considerable number of gas-works with our automatic coal and coke handling machinery; but, so far, our operations have been confined to large, or fairly large, works. I am therefore unable to give you details of the working of automatic appliances in small works. But the custom in the engineering profession is to try new appliances on a small scale; and, when the experiment is successful, the shrewd and capable engineer proceeds to carry out the improvement throughout his works. This has been the course followed by gas engineers in introducing coal-handling machinery in connection with inclined retorts; so that, although I am not provided with the *data* for this paper regarding installations of automatic appliances in small works, I am able to put before ou the particulars of installations which were small plants in large works. The experimental settings tried at Southall, Birmingham, Rochdale, Burnley, Coventry, Leigh, Oxford, and Middlesbrough contained from one to five beds, or five to thirty retorts; and the coal-handling plant consisted simply of the automatic appliances necessary for a small retort-house.

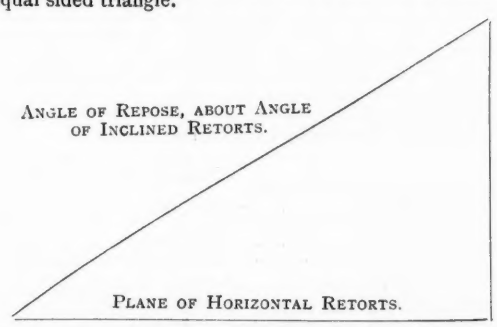
The two years subsequent to my last appearance before you (1890 and 1891) were principally devoted to supplying and erecting appliances for small experimental installations while 1892 and 1893 have seen the extension and completion of large automatic retort-houses on the new principle.

It would occupy too much time to refer in detail to the automatic appliances erected in connection with all the small or experimental installations; so I confine myself to one—viz., Middlesbrough—and the *modus operandi* which obtained there will serve to indicate generally the methods followed at the other works. I select Middlesbrough because Mr. Terrace, the Engineer and Manager there, was so long "one of yourselves;" and although, like Jock o' Hazeldean, "o'er the border and awa'," he is still more a Scot than any "Mac" on the N.B. roll of membership (*vide* the North of England men), and it would be gratifying to his numerous friends north of the Tweed to observe that not only was the paper he read last month at Belfast the subject of unstinted praise, but it very visibly disturbed the prophets who had, at former meetings of The Gas Institute, prognosticated that the "inclines" would, after a sickly infancy, fall into a rapid decline. As the new system has got quickly over the defects in details common to the introduction of all new processes, and has gained so many champions, it is safe to conclude that there is a future for the principle of charging gas-retorts by gravitation. Still, I need not indicate a preference for any system; as it is now palpable to all that, whether inclined, revolving, or horizontal retorts with mechanical chargers are used, coal breakers, elevators, conveyors, and hoppers are indispensable auxiliaries. But it strikes me that the natural sequence is that the law of gravitation should be taken advantage of to the full as the coal gravitates from the hoppers. With which of the systems can this be best attained?



FRONT VIEW OF SMALL RETORT-HOUSE, EQUIPPED WITH AUTOMATIC APPLIANCES.

The answer can be made very plain by the aid of a scalene or unequal sided triangle.



From a given point (the bottom of the hoppers) the law of gravitation can be utilized to slide the coal down the hypothenuse of the triangle; but to get the coal along the base after it drops down the perpendicular side, mechanical force must be applied. So in charging the "inclines," the coal falls from the hoppers through the portable shoots; and the momentum thus acquired spreads it over the retorts, in the way other materials gravitate down an incline equal to the hypothenuse of the triangle. In the case of the "horizontals" the coal drops like any material falling down the perpendicular side, and is then scooped or pushed by the mechanical chargers into the retorts, set on the same plane as the base

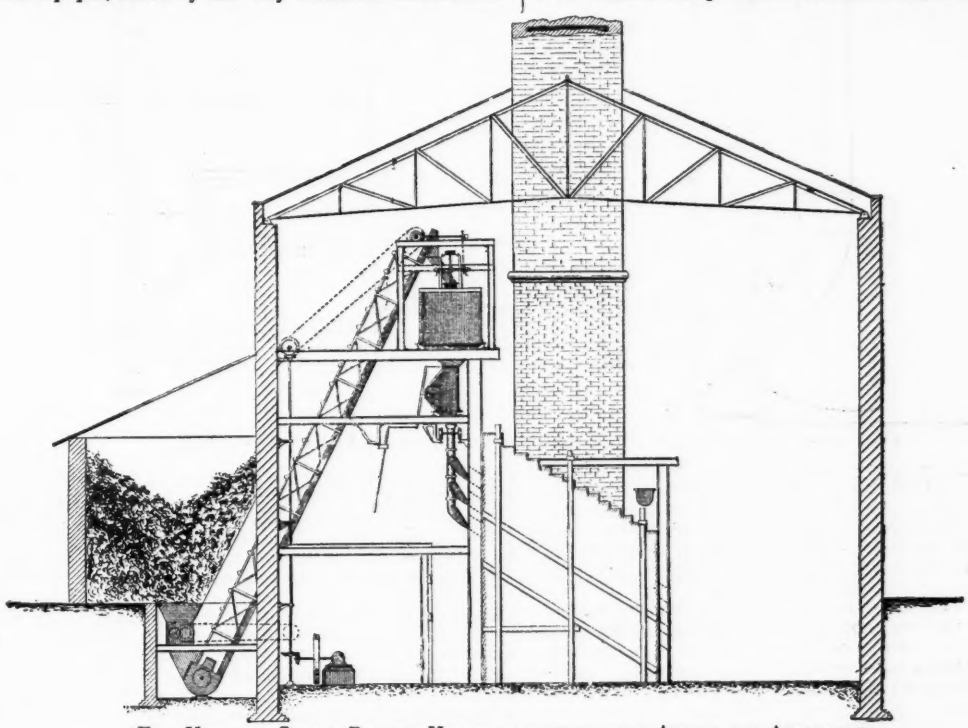
of the triangle. This having been made luminous by Mr. Terrace in his paper, followed by Mr. Winstanley's neat and needed reminder regarding the years consumed in "coaxing mechanical chargers," the "scooping school" has been fluttered into a concerted condemnation of "inclines," in which the liberty of lamentation proper to perturbed prophets is prominent. If "rotary" or any form of "continuous" carbonizing has a future, conveyors and elevators will play an important part.

In the paper which Mr. Terrace read before the members of The Gas Institute at Belfast, he confined his remarks on the machinery, as you would notice from the very effectively illustrated article which appeared in the JOURNAL OF GAS LIGHTING, to the extended coal and coke handling plant, as arranged for the whole of the retort-house; so I do not go on old ground in referring to the automatic appliances he used to charge the retorts of the experimental settings. The arrangement was as follows: An elevator was fixed, so that the coal could be tipped from the waggons into a receiving hopper over the elevator-boot. Over the elevator-boot a pair of crushing rolls was fixed, to reduce the coal to the desired size. The coal, on passing through the rolls, dropped into the elevator, and was lifted to a receiving hopper fixed above the top mouthpieces of the inclined retorts. The coal was delivered through the doors in the bottom of this hopper into a portable truck, which held the charge for the retorts. This experimental plant at Middlesbrough formed practically a small retort-house automatically equipped. In the extended plant (as you would all gather from Mr. Terrace's paper, aided by the very elaborate illustrations reproduced in the JOURNAL from the Middlesbrough drawings), the extensions have been arranged by Mr. Terrace with little of that nervous timidity which upsets so many men when they leave the "beaten track." No; having made sure of the general principles in his experimental plant, Mr. Terrace can now trust them implicitly, and he has wisely carried them out in a way in which the first cost of the new system and the automatic appliances is considered of far less importance than any diminution in efficiency.

This feeling I find prevails almost universally among the gas engineers who aspire to lead the van of progress in the introduction of automatic appliances in gas-works. In the manufacture of the automatic machinery, improvements have been made by "leaps and bounds," through close heed having been given to the hints and wants of those gas engineers who have improved the modes of handling coal and coke, so that the work is rendered practically labourless. The complete mechanical manipulation of the coal, from the time it is discharged from the waggons or barges until it is delivered as coke to the yard or waggons, is now attained in modern equipped retort-houses of large size; and perhaps one of the most complete so far in England is that at Leigh, which is a medium-sized gas-works, where, in addition to an up-to-date automatic retort-house, Mr. Fletcher, the Engineer and Manager, has arranged a self-acting plant, which carries the coke from the retort-house direct to the storeage hoppers, from which the trucks and carts are filled automatically. But the question I am confronted with almost daily is, "Can a similar state of efficiency be attained with a paying saving in labour by using automatic appliances in small gas-works?" and my most persistent interrogator has been your President, Mr. Douglas Hall—his interrogations at last taking the shape of a command to prepare a reply, and convey it to the members of this Association in a paper.

Well, from the experience gained in the working of the small plants in large works, I could safely answer with a simple affirmative, as all engineers (including Mr. Maurice Graham, the Engineer to the Automatic Coal-Gas Retort Company, who use our appliances on the settings worked under their patents) are convinced that, without conveyors and elevators to manipulate the coal, a saving in labour cannot be effected in retort-houses. But, with the hope of making my "Yes" somewhat emphatic, I have prepared illustrations, showing automatic appliances arranged in a small retort-house with inclined retorts.

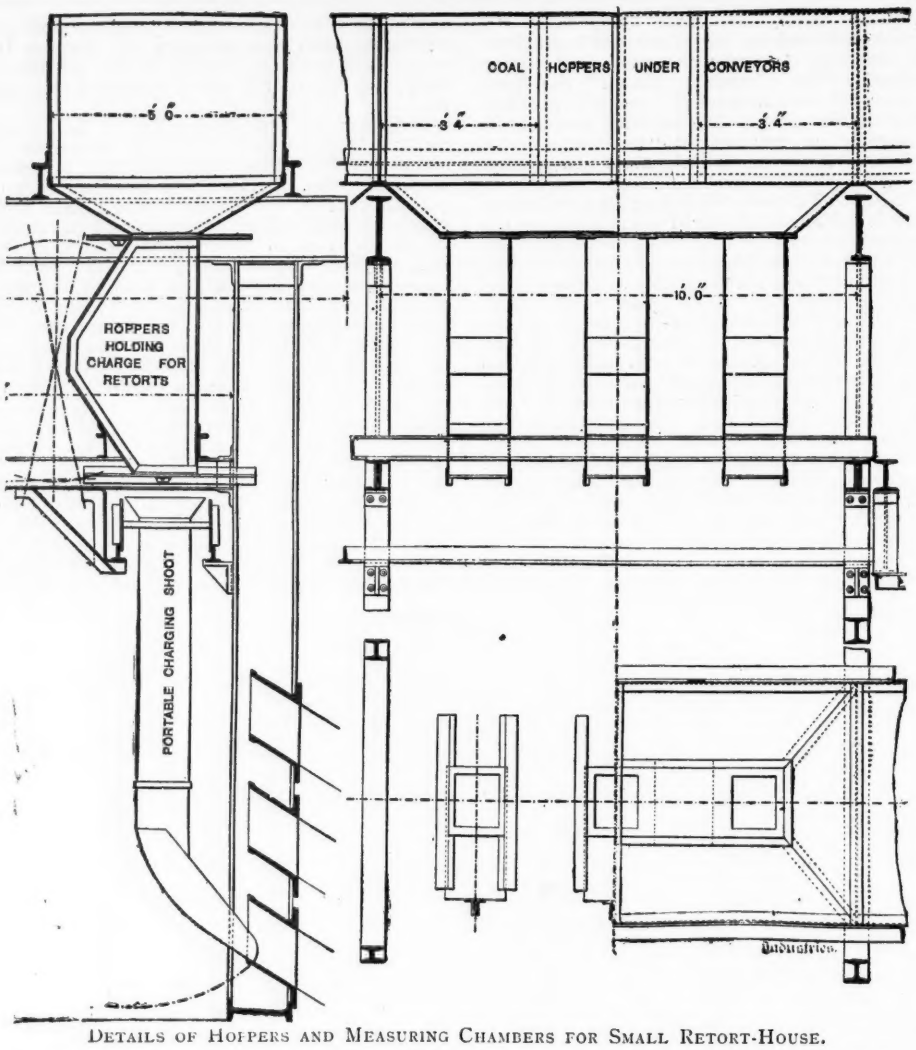
From the illustrations you will notice that the retort-house with inclined retorts has three beds of seven retorts. The coal falls into the hopper over the coal-breaker, and is lifted by the elevator to a steel chain, or steel-rope push-plate conveyor with a special form of cast-iron trough, which distributes the coal into the storeage hopper arranged over the top mouthpieces of the retorts. Under the storeage hoppers the measuring chambers are fixed, to hold a charge for each tier of retorts; and from these the charge for the retorts is conducted through the portable shoots. This plant is driven by an engine with a 6-inch cylinder; and the driving arrangement is very simple. The engine is connected to the small vertical shaft which communicates the motion to the short countershaft. On this countershaft two sprocket wheels are fixed, to drive the elevator and conveyor, by means of a detachable compressed-steel chain. The cost of the machinery, including engine, coal breaker, elevator, conveyor, storeage hoppers, measuring chambers, portable shoots and accessories, would be about £450, erected.



END VIEW OF SMALL RETORT-HOUSE, EQUIPPED WITH AUTOMATIC APPLIANCES.

I have limited the illustrations to an arrangement for inclined retorts; but almost the same quantity of automatic appliances would be required to deal with three beds of ordinary horizontal retorts stoked by manual-charging machines. The engine, coal breaker, and elevator would be the same for horizontal retorts as for the "inclines;" and the difference would consist in having the storeage hoppers fixed in front, to fill the manual charging-scoops. We have two plants of automatic conveyors and elevators in operation at the works of the Lancaster Waggon Company, Limited, in connection with two ranges of gas-producers; and the machinery is almost identical with what I have outlined as necessary for small retort-houses with inclined or horizontal retorts. The two arrangements of automatic appliances at Lancaster are so satisfactory that we have the order to supply the machinery for a third range; and I am empowered to state that Mr. Shackleford, the Managing Director of the Lancaster Waggon Company, will be pleased to allow any member of this Association to inspect the automatic systems in operation.

The automatic plants I have outlined, for inclined or ordinary retorts, could be arranged with a self-acting coal-store, having a conveyor delivering the coal into the hopper over the coal-breaker. A new retort-house with twenty beds, designed by Mr. T. B. Ball, of Rochdale, is arranged with an automatic coal-store having two conveyors in the bottom, one 80 feet and



DETAILS OF HOPPERS AND MEASURING CHAMBERS FOR SMALL RETORT-HOUSE.

one 110 feet long, conveying the coal from any point in the store to the two coal-breakers. The automatic coal-store is not an experiment, as it is on exactly similar lines to the self-filling and self-emptying coal storeage plants which we have erected within the last four years for Messrs. Guinness, of Dublin, Sir Wm. Armstrong, Mitchell, and Co., of Newcastle, and over a hundred hardly less well-known firms.

The machinery for both the horizontal and inclined retorts would only require to be run about two hours during the day-shift to fill the hopper for the day and night supply. The breaker, elevator, and conveyor are driven by our new patent compressed-steel detachable chain, which is the best transmitter of power in gas or dusty works.

The great progress made during the last four years with automatic conveyors and elevators to manipulate the coal in gas-works is apparently to be followed by similar activity in the installation of like self-acting machinery to deal with the coke. Already the "thin end of the wedge" has been introduced; and small experimental installations have been tried. The first coke-elevator we supplied for a gas-works was for an arrangement designed by Mr. Baker, of Reading. This elevator lifts the coke from the yard to a coke-breaker. The broken coke is screened into four or five sizes, and falls by gravity into the sacks arranged to receive the different grades. This "elevator" is a combination of the ordinary bucket elevator and tray conveyor, and is known as the "tray-bucket elevator." Mr. Terrace inspected the coke-elevator at Reading before he entrusted my Company with the contract for the coke-elevator at Middlesbrough. Another small coke-elevating plant has been supplied to the order of Mr. James Eldridge, of Oxford. This is arranged to fill the railway trucks automatically. The slaked coke is shot from the barrows into the elevator, which is set on an angle of about 45° and parallel with the railway. The coke is delivered by this tray-bucket elevator to a short tray conveyor, which trims it into the railway waggons. This is a small experimental plant to test the machinery thoroughly, with a view to the adoption of an extensive automatic coke-handling system in a new retort-house now in course of construction at Oxford. Mr. Winstanley, of Coventry, has also arranged a coke conveying and elevating plant; but this is too extensive to come under treatment in a paper on "automatic appliances for small works."

I have purposely refrained from referring to the details of systems of conveyors and elevators to deal with anthracene, sulphate, &c.; as plant of this class is not of immediate interest to managers of small works. But I may state, for the benefit of the members who will doubtless obtain the management of larger works, that our automatic arrangements for anthracene, sulphate, and other chemicals could hardly work better.

Permit me to add, in conclusion, that through the experience gained during the last twelve years in introducing numerous contrivances to shorten processes, and cheapen the cost of handling all kinds of materials, particularly coal, coke, lime, and oxide, we have succeeded in devising labour-saving tools which enable us to manufacture automatic appliances as suitable, efficient, and durable for small gas-works, as the similar apparatus for large installations; and I confidently expect to see the commendable enterprise displayed by several of the gas engineers of large corporations emulated by those having charge of small works, so that the workmen in both large and small retort-houses will soon become merely the attendants on machinery, producing results, with swiftness and accuracy, vastly superior to hand labour.

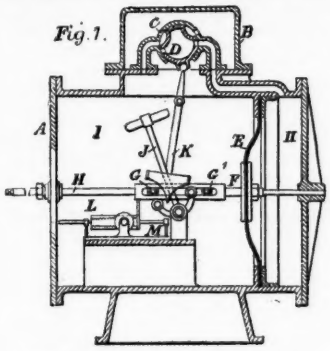
East Cowes Gas Company, Limited.—Mr. Robert Fish, Assoc. M.Inst.C.E., of 5, Great Winchester Street, E.C., has recently taken the lease of the above-named Company's works, which supply Her Majesty's Isle of Wight residence (Osborne House) as well as the town of East Cowes.

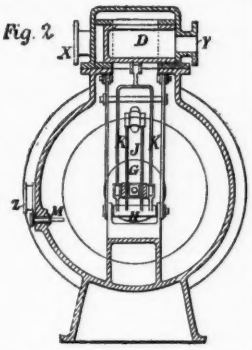
Iron and Steel Institute.—The autumn meeting of this Institute is to be held at Darlington from the 26th to the 28th prox., when a good list of papers will come before the members for discussion. Among them will be one by Professor Roberts-Austen, on the influence of the rating of the rupee on the world's iron trade; and another by Mr. Kupelwieser, the eminent Austrian Engineer, on the recent developments of the steel industry in Austria. Mr. H. Bauerman (one of the Jury for Mines and Metallurgy at the Chicago Exhibition) will discourse on the "Metallurgical Exhibits at the World's Fair." The members will have the advantage of visiting the numerous iron and steel works in the vicinity of Darlington; and excursions to Barnard Castle and Raby Castle have been arranged by the President (Mr. D. Dale), the Hon Secretary (Mr. J. I'Anson), and the Local Reception Committee.

REGISTER OF PATENTS.

Liquid and Gaseous Meters.—Paasch, H., of Buckau, Germany No. 14,107; Aug. 4, 1892.

This meter for liquids and gases is provided with a pulsating diaphragm fixed on a sliding rod; the combination of this latter (by means of rollers adjustably arranged thereon) with a weighted pendulum lever and reversing lever controlling the distributing-valve, as well as a transmitting device combined with a counter.





The casing A is closed by a cover B; and a diaphragm E is fixed with its peripheral edge so as to divide the casing into two chambers I. and II. Each is connected by a passage with a valve-box C, wherein is arranged the reversing device, which is a circular valve D, The diaphragm is attached to the guide-rod F; and this ends in a sleeve in which a spindle H, with two screw-nuts G G_1, is arranged in such a manner as to enable the nuts to be adjusted by turning the spindle. According to whether the spindle is turned to the right or the left, the two nuts are approached to, or removed from, each other. The spindle penetrates the wall of the casing, and can be turned from the outside by a key to alter the distance between the nuts. A weighted lever J is provided with projecting arms carrying small rollers—the plane of movement of the lever being the same as that of the rollers which are carried by the nuts arranged on the spindle H. The axes of these rollers slide in longitudinal slits of the frame-like sleeve of the guide-rod F, and thus prevent the nuts from turning. The head of the lever is formed as a closed tube partly filled with mercury. The mechanism as so far described actuates the valve D by means of a forked pendulum-lever K, which, with its two arms, moves in the track of the rollers on J. By means of the bracket of the sleeve of the guide-rod F, this is in connection with a transmitter L, respectively with the shaft M, which transmits the movements of the guide-rod F to a counter Z.

The liquid enters by the pipe X (fig. 2); and, if the parts are in the position of fig. 1, it passes through the valve D into Chamber I., and pushes the diaphragm E to the right. The guide-rod F of the diaphragm touches with its left rollers the arms of the weighted lever J, moving it towards its vertical position. If the head of the lever has passed a little over the middle line to the right, the mercury, flowing to the right side of the head of J, causes the lever to quicken its movement in its direction. The rollers push against the lower ends of the pendulum-lever K, the upper arm of which, engaging with a notch of the valve D, effects the reversal of the latter, so that the liquid is conducted through the valve-box to Chamber II. The return movement of the diaphragm presses at the same time the measured liquid from Chamber I. through the valve D to the outlet Y. During the whole movement of the diaphragm to the right, the transmitting mechanism L rotates the shaft M; and during the next movement to the left, and all following movements, this rotation continues in the same direction.

Gas-Fires.—Dick, W. B., of Putney. No. 14,218; Aug. 27, 1892.

The stove consists of a hollow iron casting, fitted with a brick (preferably curved), and having a series of narrow slots, with pencils of asbestos placed between. There is a sheet of gauze between the casting and brick to prevent any firing-back. At one end of the casting is a hole, to which a Bunsen bulb is attached; and, as the gas passes through the bulb, it fills the chamber in the casting, and oozes through the perforations in the gauze. On being lit, it is said that a "fine and regular heat is given off."

Gas Cooking-Stove.—Dick, W. B., of Putney. No. 14,219; Aug. 27, 1892.

This invention relates to a condensing cooking-stove, the oven and other inside parts of which are heated entirely by Bunsen burners (placed on the outside of the oven and other inside parts), but playing directly on the bottom of the oven. The products of the consumed gas immediately pass round the outside of the oven and other inside parts, down the condensing-tubes situated at the back, and are there condensed. Any air or uncondensed gases pass up a tube placed inside the condensing-tube, and escape through an outlet at the top provided for the purpose.

Intensifier for Gas-Lights.—Guthrie, J. T., of Leith. No. 15,213; Aug. 24, 1892.

This is another form of the now well-known "perfecter"—a ring or short cylinder of metal for attachment to gas-burners, by the use of which, it is claimed, "any ordinary burner will give a greater amount of light." The diameter of the cylinder is large enough to receive a gas-burner, and about $\frac{1}{24}$ inch thick by about $\frac{1}{2}$ inch in length, It is indented about $\frac{3}{16}$ inch from one end, to keep it in proper position when fitted to burners in use; or it may be screwed internally from the bottom to about $\frac{3}{16}$ inch from the top, for fitting to new burners. The top portion of the cylinder is partly cut away, compressed, or widened, according to the shape of flame required. To use the cylinder, it is placed over the burner, and either pressed or screwed down until the top of the burner is about $\frac{3}{16}$ inch from the top of the cylinder; or, when made with the burner, the gas-outlet would be about $\frac{3}{16}$ inch from the top of the metal. From 30 to 50 per cent. increase in light is asserted to be obtained by the use of the appliance.

Cooling Gas-Engine Cylinders and Pistons.—Brünler, O., of Leipzig, Germany. No. 16,382; Sept. 13, 1892.

To carry out this invention, the cylinders, &c., are at some distance surrounded with a cooling-jacket of wire gauze, which is so fine as not to let water through, but yet permit the latter to evaporate. The interspace closed up by the jacket is continued through perforations opposed by similar perforations of the stationary crank-axle. The latter is hollow from these perforations up to the pipe which leads into the water-reservoir used. The interspace, which is closed up by the jacket, is now filled with water, and the cock thereon is then opened. When the motor is at work, strong evaporation takes place through the wire gauze; and this tends to cool the cylinders. The evaporated water is replaced by fresh water from time to time.

Water-Pipes.—Ovenden, P., of Bristol, and Bunker, H. E., of Manchester. No. 17,633; Oct. 4, 1892.

The claim for this invention in pipes for the conveyance of water is in making them with longitudinal corrugations on both the inside and outside surfaces; the recesses formed by the corrugations on the inside of the pipes corresponding with, and running into, the prominences or ridges formed by the corrugations on the outside. The pipes being made of metals or alloys of a flexible nature (such as lead), the corrugations prevent the bursting of the pipes by the expansion of the water contained in or passing through them when in the act of freezing.

Gas-Engines.—Southall, J., of Worcester. No. 18,020; Oct. 10, 1892.

The patentee proposes to construct gas and oil motor engines to act as follows; the cycle being that known as the "Otto," and the valve arrangement a modified combination of the constructions described in patents No. 9038, of 1891, and No. 1203, of 1892, operated entirely from a motion-shaft, driven by gearing on the crank-shaft of the engine: The lifting of the compound valve, which performs the duties of supply, exhaust, and ignition, or only of exhaust and ignition, is accomplished by causing the operating mechanism to act on the end of the spindle of a small check or ignition valve, as described in the 1892 patent. This mechanism is, by preference, a lever pivoted to the cylinder, and moved by a sliding cam sleeve on the motion-shaft, into which its one end engages. The cam action is arranged to operate the lever, and cause its other end, which works in an eye on the valve-spindle, to impart to the valve as a whole, the necessary forward movements for supply and exhaust, and to the small ignition-valve already mentioned the necessary lift for ignition. When the engine exceeds its normal speed, the governor lowers a rod between a projection on the inner side of the lever and the cylinder end—thus preventing the lever moving in to operate the valve. When this occurs, the cam-sleeve (which, during the regular running of the engine, is kept in its place by a spring sufficiently strong to enable it to perform its functions without sliding back along the shaft) gives to the lever, and is driven back along the motion-shaft, so as to compress the spring. The governor-rod has notches down its side, into which a weighted pawl drops when the rod is depressed. This prevents its rising again till it is released by the withdrawal of the pawl, which is done by the action of the lever pulling it back when about to lift the valve. The rod, after being lowered, is thus free to rise after any two revolutions of the crank-shaft. The top end of the rod is made with a slot in it; so that if, when the governor allows it to descend, it should come on the top of the projection on the lever, the pin in the slot slides down it, and no harm is done. The governor is driven from a pulley on the motion-shaft.

Gas Heating-Stove.—Hilton, T., of Oldham. No. 19,850; Nov. 4, 1892.

This heating-stove consists essentially of an outer tube or casing fitted with or enclosing an inner tube or casing, and provided at its lower extremity with an opening to receive an Argand gas-burner or lamp. Between the two tubes an annular space is left; and in the sides of the outer tube, and in a plate which covers the top of the tube, perforations are formed opening into the space. The heat of the lamp in rising impinges against the inner tube, and thus heats it; hence the air in the annular space becomes heated, and passes out through the perforations in the cover into the place to be heated, while cold air enters the space though the perforations in the side of the outer tube.

Carburetting Apparatus for Gas-Lights.—Parkes, J. and J., of Birmingham. No. 20,190; Nov. 9, 1892.

This invention (in the albo-carbon type of appliance) relates to the means by which the necessary heating of the gas and melting of the carbon is effected—its object being to provide that the heating gas-flame is taken from the supply before it has become carburetted; also that it is so located as not to interfere with the carbon vessel, nor yet to limit the position of the illuminating lights. The arrangement in question is applicable to chandeliers or lamps where the carbon vessel is situated below the illuminating lights. From the manner in which such lamps are now constructed, it is necessary to have the heating flames near to the side of the down pipe; and, consequently, the radiating side heat is not so effective as if used in a vertical position. Also, for the sake of uniform appearance, a number of such lights are placed around the pipe, one of the objectionable effects of which is to increase and make more definite the shadow from the vessel below them. All these objections are said to be overcome in the arrangement here referred to.

Destroying the Carbon Products of Gas Combustion.—Adcock, R., of Hornsey. No. 21,444; Nov. 24, 1892.

In the words of the patentee, this is "an invention for destroying the carbon products of combustion of gas, supplied through gas-burners, by means of an improved smoke-consumer, placed above the

gas-flame. . . The invention also increases the illuminating power of the gas-light, without increasing the supply or pressure of the gas; and, further, by destroying the carbon products of the gas combustion, keeps purer the surrounding air." The consumer consists of one or more mesh layers "of a mineral material" fitted into a rim or coronet, which mesh, when heated by the gas, consumes the carbon products of the gas.

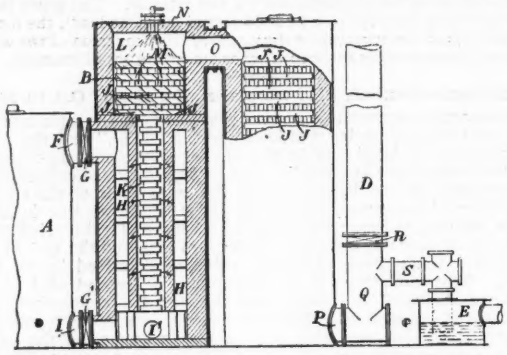
Indicating and Recording at a Distance Changes of Level in Reservoirs, Tanks, Gasholders, &c.—Burr, J., of Kilmarnock, and M'Whirter, W., of Glasgow. No. 5575; March 15, 1893.

This invention in constructing and combining or arranging the parts of automatic apparatus for indicating and recording at a distance changes of level or position of water or other fluid in reservoirs, tanks, gasholders, or other structures or articles, substantially consists in a series of minor developments and improvements in apparatus of the kind described in patent No. 14,902, of 1887. The modifications, however, are not describable apart from the four sheets of detail drawings which accompany the present specification.

Carburetters.—Collins, C. R., of Philadelphia, U.S.A. No. 10,227; May 23, 1893.

This invention relates to carburetters such as are used in water-gas plants for enriching the water gas.

A is a gas-generator; B, the carburetter; C, a fixing chamber; D, the stack; and E, the washer for the gas—all of which parts, except the carburetter, are of familiar construction. It therefore only needs



pointing out that a conduit F, having a valve at G, leads from the generator into an annular chamber H, formed in the carburetter B around an interior chamber K open at the bottom and top (as shown), and filled with brick checker-work J of the ordinary kind. I is a conduit opening into the bottom of the carburetter, and leading from the generator. The conduit F is preferably used for the producer gas formed in blowing up; and the conduits I and F, at will, for the water gas. G and G¹ are valves in conduits F and I; and I is an air-blast opening. At the top of the chamber K is an enlarged chamber L—also filled with checker-work, as shown at J and M; the upper layer M being of iron, and the depth of the iron checker-work being such as will ensure that no fluid oil will pass beyond it (in the construction shown below it), and come in contact with the brick checker-work. This forms an important feature of the invention, and is said to make the carburetter much more durable, as the oil, when it comes in direct contact with the brickwork, has a disintegrating effect and rapidly destroys it. N is the oil-injector situated next to the iron checker-work; O, a conduit leading into the fixing chamber C, also filled with checker-work; and P, a conduit leading to the washer E through the pipe S or to the stack Q, which is provided with a valve R.

In practice, when the generator is blown up, the valve G¹ is closed; the gases passing through the conduit F into the annular passage H, serving to heat the walls of the chamber K. On being mixed with air from I¹ and ignited, it passes up through the chambers K and L, the conduit O, the chamber C, the conduit P, and the stack Q, to the atmosphere. When water gas is being made, the valve G is closed and G¹ opened (or G¹ closed and G opened, as may be desired); and the gas enters the carburetter through the conduits I or F—passing up through the heated checker-work in the chambers K and L. The injector N at the same time throws a spray of oil down on the iron checker-work, which serves to vaporize it, together with the action of the hot gas. The vapour and gas pass together to the fixing chamber C, and thence to the washer—the valve R being closed.

Lighting and Extinguishing Series of Gas-Lamps.—Hartig, I., of Munich, Germany. No. 10,519; May 29, 1893.

The purpose of this invention is to provide means by which a series of gas-lamps—such as the lamps of a railway train—may be lighted when desired, and also extinguished, all by one movement for the one or other purpose. It depends principally upon the employment of an unstretchable chain, passing along the roofs of the carriages of the train, and connected at intervals to lever mechanism; so that, by pulling this chain, the various mechanisms are operated, and cause the gas to be turned on in each lamp, and small continuously burning pilot flames to be brought into position to light the main flames, and to afterwards resume their place. The chain, maintained against the action of a counter-spring, will, when released, be drawn back by the spring, and will extinguish the main flames of the lamps by cutting off the gas supply.

Gas Lighting, Extinguishing, and Controlling Apparatus.—Sangster, J., of Buffalo, New York, U.S.A. No. 10,638; May 30, 1893.

This invention relates more particularly to that class of gas lighting and extinguishing apparatus wherein a variation of the pressure in the main is utilized in the operations of lighting and extinguishing. It consists, broadly, in novel means for controlling the flow of gas to the burner-tip; in the combination with these means of controlling the gas of an igniting apparatus which may be electrical or mechanical; and in the combination with the gas controlling and electrical igniting device of an auxiliary lighting device.

In addition to the usual gas-supply pipe and burner, a pressure-operated valve is used for controlling the flow of gas to the burner; and, by preference, an electrical gas-igniting device for each burner, which device is included in a local circuit normally open, and having a circuit-closer actuated either directly or indirectly by the variations in pressure. All the lamps supplied from a common main may be lighted or extinguished practically at the same instant; but if it is desired to light or extinguish the different lamps at various times, this may be accomplished by arranging the valves to respond to different pressures—those operating with the lowest increase in pressure being first lighted or extinguished.

In one embodiment of the invention, the patentee employs a receptacle or tank, mounted upon the gas-supply pipe, and adapted to contain a sealing liquid, and having a gas passage registering with the supply-pipe. An inverted cup, which carries a valve, is moveably mounted in an inverted position over the gas-passage in the tank; the edge of the cup being submerged in the liquid which forms the seal. The gas is thus admitted to the lower side of the cup; and pressure is constantly exerted thereon. Upon this moveable cup, which is preferably hinged at one end of the tank, a burner is mounted; while a prolongation of the burner-tube is adapted to serve as a valve by seating itself in a shallow well formed in the tank bottom, and containing mercury. This valve, when submerged in the mercury, prevents the passage of gas to the burner-tip; but when the gas pressure is increased sufficiently to overcome the weight of the cup, it causes an upward tilting or rocking thereof. Upon an operative increase in the gas pressure, the cup is raised, and the prolongation of the burner-tube lifted out of the mercury; thus permitting the gas to flow to the burner-tip.

A latching device is applied to the cup, preferably on its side opposite its pivot. The latching device is also submerged in the mercury, and adapted to sustain the cup in its elevated position, so as to permit the flow of gas to the burner; while, upon a second operative increase in pressure, the latching mechanism will be released, and permit the cup to descend to its normal position, and the valve will cut off the supply of gas to the burner.

The electrical igniting apparatus consists of a battery, conductor, and lighting device. The lighting device most approved of is that shown in the United States patent No. 359,053, where the sparking coil and armature are concentric to the gas-passage, and the electrodes are arranged in proximity to the opening of the tip. The battery is preferably located within the hollow of the base of the gas-post, or underneath the ground in proximity thereto; and one pole will be connected, through the gas-supply pipe and metal parts mounted thereon, with one of the spark-producing electrodes; while the other electrode will be joined to the opposite pole of the battery through wires carried upon, but insulated from, the gas-supply pipe and metal parts. The circuit is normally open; and a circuit-closer comprising two contacts—one mounted upon, but insulated from, the tank, and the other likewise mounted upon the cup—is actuated by the movement of the cup under an operative increase of pressure in the gas-main, to close the electrical circuit, so as to ignite the gas by means of the sparking device. The lighting device is thus within the influence of the flame, except during the period of ignition.

As an auxiliary to, or substitute for, the electrical igniting apparatus, a pilot-light may be maintained for igniting the full volume of gas when admitted to the burner-tip. This pilot-light may be maintained at the burner-tip by an opening or "thief," which will permit a small amount of gas to pass from the supply-pipe to the burner-tip, or it may be in proximity to the burner-tip at the end of a bye-pass pipe communicating with the supply-pipe. The pilot-light would be used in lieu of the electrical igniting device only during those portions of the year when freezing or moisture upon the moveable parts of the igniting device would prevent its proper operation.

The increase of pressure, whereby the cup is actuated, is temporary only; and therefore some means for sustaining the moveable member in its raised position becomes essential. To this end, a latching mechanism is employed. This comprises a pin secured to the moveable cup, and adapted to ride in a heart-shaped cam slot formed in a pivoted cam. The slot is of such shape that, upon the upward movement of the pin, the cam is swung upon its pivot; and upon a reduction sufficient to permit the cup to descend, the pin bears upon the cam and rides on one surface of it to a suitable seat, wherein it is sustained, thereby upholding the moveable cup. In this position it remains while the light is maintained. When it is desired to extinguish the light, the pressure is again operatively increased; the cup is raised; and the pin passes out of its seat. It then again engages one of the surfaces of the cam, turning it still further upon its pivot; and, on a reduction of pressure, the cup descends by gravity, and the pin and cam are returned to their original positions.

APPLICATIONS FOR LETTERS PATENT.

15,446.—Bouvier, A., "Syphon test-box for gas-mains." Aug. 14.

15,515.—Abel, C. D., "Gas-producers." A communication from the Gas Motoren Fabrik Deutz. Aug. 15.

15,520.—Willings, H. C., "Gas-stove." Aug. 15.

15,740.—Orme, D., "Prepayment gas-meters." Aug. 19.

15,748.—Richardson, B., "Glass globes and the like for gas and oil lights and lamps, and smoke consumers for the same." Aug. 19.

The Blackmoor Tunnel of the Leeds Corporation Water-Works.—At the meeting of the Leeds Corporation Water Committee on the 18th inst., it was reported that the construction of the Blackmoor tunnel had been completed, at a cost of £24,229; and the water supply is now passing through it. The work was finished under the supervision of the City Engineer (Mr. T. Hewson); the contractor (Mr. Simpson) having relinquished it. There was a difference of £237 between the tender price and the actual cost; but taking into consideration Mr. Simpson's losses in connection with the earlier portions of the work, the Committee decided to write off this amount.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following Bills received the Royal Assent last week: Aberdeen Corporation Bill; Leeds Corporation Bill; London County Council (General Powers) Bill; London County Council (Subways) Bill; St. Helens Corporation Bill; West Hampshire Water Bill.

LEGAL INTELLIGENCE.

MANSION HOUSE POLICE COURT.—Thursday, Aug. 24.

(*Before Alderman Sir* A. Lusk.)

The Gaslight and Coke Company Fined for Deficiency in Illuminating Power.

To-day, The Gaslight and Coke Company were summoned by the City Solicitor (Mr. H. H. Crawford), on behalf of the Corporation of London, for having on March 18 supplied gas at the Kinghorn Street testing-place, and on June 26 at the Dorset Buildings testing-place, of half a candle less illuminating power than it ought to have been.

Mr. Monier-Williams, Solicitor, who appeared on behalf of the Company, stated that although they had great difficulty in keeping up the standard of their gas, owing to the variable quality of the coal supplied, they succeeded in a remarkable way in doing so, because, out of 2257 tests made during the past half year, in only two instances was there found a deficiency. The Company complained that the tests on which the proceedings had been taken were made during the night, and therefore they showed a falling off in illuminating power. At the other testing-places, the gas came out at more than 16 candles. It was admitted that it was generally above the standard.

Alderman Lusk: The Company have been weighed in the scales and been found wanting. Why do they not make gas of 17-candle power, instead of barely the 16-candle statutory power? I notice that the Company, who pay large dividends, never exceed 16 candles; and, judging from the experience of my own gas, I should think it is often 14 instead of 16 candle power.

Mr. Monier-Williams: That is probably the fault of your burners.

Alderman Lusk: It is sure not to be the fault of the Company. I know something about gas. The Company can give 17-candle power if they like, and then they would be on the safe side. You know, you gas and water companies are very powerful, and have a monopoly; and therefore you should be very discreet, or else some day people will rise up and say they will have no more to do with you. Poor people who get gas of only 13-candle power cannot prosecute you. The Company must pay 40s. in each case; and if my powers were greater, I do not know how far I should go.

The City Solicitor said he did not ask for costs.

A fine of 40s. was imposed in each case.

A Woman Suffocated by Gas at Leeds.—An inquest was held at Leeds yesterday week on the body of Elizabeth Ann Ramsden (aged 42), a widow, residing in Stapleton Street, New Wortley. On the previous Friday, the people living in the district missed her, and informed the police of the fact. Two police-constables entered the house, and found Mrs. Ramsden in bed quite dead. The officers noticed a very powerful smell of gas; and an examination showed that gas was laid on to the room, but that no bracket had been attached to the pipe. The result was that an extensive leakage of gas had occurred. The jury came to the conclusion that the cause of death was suffocation by coal gas, which had escaped through defective fittings; and a verdict of "Accidental death" was returned.

The Electric Lighting Scheme for Bolton.—It is estimated that the cost of the Bolton electric lighting undertaking will be £21,000; but the Corporation have decided that it is desirable to have power to borrow as much as £40,000, in order that they may be prepared for extensions, if a demand should arise for the light outside the compulsory area. The details of the scheme were explained to Major-Gen. Crozier, who, as representing the Local Government Board, held an inquiry in the town last Tuesday. The system decided upon is that of the alternating high-tension current, with transformers. These, however, are not to be placed on the premises of each consumer, but are to be established in different parts of the borough; and the current is to be supplied through them in supply centres. Evidence as to the details of the works and buildings proposed to be erected having been given by Mr. J. H. Rider, Electrical Engineer, and Mr. H. L. Hinnell, architect, Major-Gen. Crozier pointed out that the Local Government Board were not likely to sanction the raising of money for works which were not actually specified; but he promised to explain the position of the Corporation to them.

The New Water Scheme for Mansfield.—The Mansfield Town Council have at length agreed to proceed with the sinking of a well on the Rainworth site, which has been the subject of much discussion for some time past. At the ordinary monthly meeting last Friday week, the Water Committee reported that they had received a letter from the Local Government Board stating that, after full consideration of the circumstances of the case, they had decided to sanction a loan of £5000, repayable in five years, for the construction of the new well, and for the works necessary for gauging and testing the quantity and quality of the supply obtainable therefrom, and should the results prove satisfactory, and the Board agree to grant a loan for the carrying out of the entire scheme, they would then be prepared to permit the reborrowing for an extended period of so much of the loan now sanctioned as might at that time be properly outstanding. The Committee recommended that application be made to the Public Works Loan Board for an advance of £5000. Some of the members opposed this; believing that an abundance of water could be found at or near the old site by boring for it. In the end, however, the recommendation was carried by fifteen votes to seven.

MISCELLANEOUS NEWS.

PROVINCIAL GAS AND WATER COMPANIES.

In continuation of our summary of the reports and accounts of provincial gas and water companies, we give the following notices of some of the statements which came to hand during the past week.

Gas Companies.

The half-yearly meeting of the Aldershot Gas and Water Company was held on the 9th inst. The accounts showed receipts amounting to £8209, and an expenditure of £5418. The Directors stated, in their report, that the results had fully borne out their anticipations; and that there had been an increase of 5 per cent. in the consumption of gas, as compared with the corresponding period of last year. The reduction in the price of 3d. per 1000 cubic feet, which took effect as from Christmas last, had not materially affected the gross revenue. The present price was 3s. 1d.—a reduction of 5d. having been made since January, 1892. In reference to the gas-works, the Directors reported that a portion of the old works, consisting of a part of the retort-house, the original engine and exhauster, and other miscellaneous apparatus (having been for some time superseded by larger machinery) had been finally pulled down to make way for an extension of the retort-house; and the value of the assets having been thus diminished, a sum of £2000 had been written off the profit and loss account, to cover this demolition. A new tar-tank had been completed; and alterations were in progress with the view of providing retort and boiler power for the probable increase of manufacture in the next year or two. Respecting the water supply, it was stated that this was now recognized as being in every way superior to private wells, which were being gradually abandoned as unsanitary sources. In view of the increased demand, an additional tube-well had been sunk, and some alterations to the pumps of one of the engines had been carried out. A dividend at the rate of £10 12s. per cent. per annum was recommended on the original shares, and £7 12s. per cent. on the "B" shares, less income-tax. The Chairman (Mr. A. F. Wilson), in moving the adoption of the report and accounts, said the balance to the credit of revenue was £2791, as against £2389 in the corresponding half of last year. This result, considering the reduction in the price, was very satisfactory. To a large extent it was due to a saving from the lower price of coal, and an increase from coke, arising from better production of that article; but there had also been an increase of about £240 in the revenue for water, and sundries had contributed more than in the corresponding period. He was happy to say that there appeared to be a prospect of continued low prices for gas coal; and as soon as they were fairly settled in their 3s. 1d. charge for gas, he thought he might at least say that the Directors would seriously consider such further reduction as was possible and safe. The report was adopted; and it was afterwards agreed that the back dividend of 6s. per share due to shareholders for 1891 should be paid.

According to the report submitted at the recent annual meeting of the Andover Gas Company, the total income for the year had been £3101; and the total expenditure, £2282—leaving a balance of £818 to be carried to the profit and loss account. This, added to the balance of £159 brought from the previous accounts, made a total of £978. Of this the interim dividend absorbed £320; a sum of £100 had been placed to the reserve fund; and there remained a balance of £558 out of which to pay a dividend for the past half year at the rate of 10 per cent., which, with the interim payment of 8 per cent., made 9 per cent. for the year.

The business of the Ashford Gas Company continues to progress at a steady rate. Including a balance in hand of £2317, the receipts for the past year totalled to £9444; and, after deducting the expenditure, the balance enabled the Directors to recommend a dividend of 8 per cent. At the meeting of the shareholders a few days since, the Chairman (Mr. Alderman Bugler) stated that in 1879, the gas paid for was 18,316,000 cubic feet at 4s. 2d. per 1000 feet; while in the past year the consumption was 31,044,000 feet, at 3s. 4d.—the yearly increase averaging nearly a million feet. It was proposed to lower the price to private consumers by 2d.; bringing it down to as cheap a rate as that charged by any town of equal size and position as Ashford. Besides this, the Directors had made an offer to reduce the price of public lighting by 2s. 6d. per lamp.

The proprietors of the Brighton and Hove Gas Company will meet next Friday, to receive the Directors' report and the accounts for the past half year. In that period there has been a small increase in the income from gas, but a decrease in the value of residual products. It is mentioned that the Bill promoted by the Company received the Royal Assent on June 9 last; and, in consequence of the increased illuminating power prescribed by this Act, the Directors express their regret that the price of gas will be necessarily increased on the 1st of January next. Having reported that the new works forming part of the third section of the Company's works at Portslade are now ready for the requirements of the ensuing winter, the Directors conclude by recommending that dividends at the rates of 11½, 8½, and 6 per cent. per annum be declared on the various classes of shares. The revenue account shows that the total amount of gas consumed was 433,174,502 cubic feet, of which 393,158,200 feet were sold at 2s. 9d. per 1000 feet; 29,718,632 cubic feet for public lighting and under contracts; and the remainder, at from 3s. 8d. to 4s. 9d. per 1000 feet. The total amount received for gas was £61,366; for meter and fittings rental, £1646; for residual products, £14,455; and for rents, £60. The total expenditure was £58,604, of which the manufacturing expenses absorbed £45,550. The balance carried to profit and loss account is £18,923; and the amount that is available for dividend is £22,028. At a special meeting to be held after the ordinary meeting, resolutions will be submitted, authorizing the conversion of the share capital into consolidated stock, and raising further stock or share capital.

Owing to the warm, bright weather experienced during the past half year, the Directors of the Dover Gaslight Company are unable to report the usual increase in the consumption of gas. With this exception, the accounts they submit to the shareholders are of a highly satisfactory character; and they recommend the full dividend

at the rate of 7½ per cent. per annum, less income-tax. The state of the Company's finances has also enabled the Directors to make a reduction of 3d. per 1000 cubic feet in the price of gas. Turning to the accounts, it is observed that the receipts for gas amounted to £12,488; for coke, tar, and other residuals, to £3524; for meter and stove rental, &c., to £493; and £133 was received by way of interest on reserve fund investments, &c. After meeting all expenditure, there is a profit balance of £3377; and this, with £1480 brought forward, makes £4857 to the credit of the profit and loss account.

The business of the Hastings and St. Leonards Gas Company is in a satisfactory position. The Directors report that, notwithstanding the exceptional climatic conditions which prevailed during a large portion of the past half year, the consumption of gas has been maintained. The increasing business necessitates additional capital; and it is proposed to issue a further amount on the security of debentures. It is also mentioned that the erection of a new gasholder is being proceeded with by the contractors, Messrs. Ashmore, Benson, Pease, and Co. The revenue account for the half year shows that the total income has been £35,403, of which £27,033 was received from private consumers and for public lighting, &c.; £1160 as meter and stove rental; £7079 for residual products; and rents and miscellaneous items make up the balance. The total expenditure was £25,267, of which £21,473 was spent in the manufacturing department. The amount remaining to be carried to profit and loss account is £10,136. With this, there is a sum of £43,578 to be dealt with by the shareholders at the forthcoming meeting; and it is proposed to pay a dividend at the rate of 12 per cent. per annum on the £25 shares, and at the rate of 9 per cent. on the £20 shares, and to carry forward the balance to the next account. With regard to the manufacturing operations, the various statements show that 15,953 tons of coal were carbonized; 163,196,000 cubic feet of gas made; and the following residuals produced: Coke, 9847 tons; breeze, 726 tons; tar, 150,736 gallons; and ammoniacal liquor, 358,607 gallons.

In presenting their annual accounts to the shareholders, the Directors of the Heckmondwike Gas Company state that the income during the past year has been £11,528, and the profits £1733, which, with the balance of £1940 brought forward from the previous year, makes a total of £3673. This sum will allow the payment of the full statutory dividends, and leave a balance of £756 to be carried forward. The Directors mention that the consumption of gas is steadily increasing, but add that exceptional causes have led to abnormally increased expenditure in renewals and alterations.

The Directors of the Morecambe Gas Company report that the results of the past year's working show an increase of £731 in receipts and £466 in expenditure, or an increase in net revenue of £265. The net profit for the year, after the payment of interest, dividend on preference stock, income-tax, &c., amounts to £2157, to which is added a balance from last year of £99. A dividend of 5 per cent. is recommended; making, with the interim dividend, 10 per cent. for the year.

At the meeting of the Pontefract Gas Company last Tuesday, the accounts which were presented, showed that the past half-year's working had resulted in an available balance of £1322, out of which the Directors recommended a dividend at the rate of 10 per cent. per annum on the original shares, and 7 per cent. on the new ordinary shares. The reserve fund now amounts to £2763. The Chairman (Mr. Alderman J. Taylor), in moving the adoption of the report and statement of accounts, expressed regret that the Board did not come before the shareholders with a better cash account; but if they compared the various items in the report with those of the first half of 1892, they would see there was no reason to be discouraged. The amount divisible among the shareholders was £260 less. The amount of coal carbonized was 1783 tons; and the gas sold to private consumers was 13,754,800 cubic feet, or a little less than before, but the quantity consumed for public purposes and under contracts showed a slight increase. There was a profit of £525 from the residual products, which was a slight decrease. They had had no difficulty in getting coal; and the stock was sufficient to last five or six weeks.

In addressing the shareholders of the Salisbury Gas Company at the annual meeting last Wednesday week, the Chairman (Mr. G. Fullford) remarked that, as usual, some of the items in the accounts were matters for congratulation, and others for regret. He had again to complain of the falling off in the receipts for residuals—to the extent of £468. They had been accustomed to regard residuals as a sheet-anchor; but he now feared they had feeble holding properties. He was pleased, however, to see an increase in the income from gas, amounting to £350, which showed that their business was growing with the city and district. In order to meet the requirements of the consumers, the erection of a new holder had been rendered absolutely necessary; but this would be ample for years to come. He moved the adoption of the report, and the declaration of dividends at the rates of 10, 8, 7, 6, and 5 per cent. on the various classes of stock; and this was agreed to.

During the past half year, the gross receipts of the Sevenoaks Gas Company were £5350; and the expenditure was £3680—showing a profit of £1670. This result enabled the Directors to recommend at the recent meeting of the shareholders, the declaration of a dividend at the rate of 10 per cent. per annum on the original capital, and 7 per cent. on the additional capital, which was agreed to.

The half-yearly general meeting of the Ventnor Gas and Water Company was held on the 15th inst.—Mr. J. W. Littlefield presiding. The recommendation of the Directors that an interim dividend for the half year at the rate of 8 per cent. per annum on the original shares, and of £5 12s. per annum on the additional shares, was adopted. An increase of £50 in the salary of Mr. J. S. Ineson, the Secretary and Manager, recommended by the Directors, was confirmed.

The ordinary half-yearly meeting of the Wakefield Gas Company was held yesterday week, when it was reported by the Directors that the balance available for distribution was £3828; and they recommended a dividend of 11½ per cent. on the old shares, 9 per cent. on the "B" fifth shares, and 8½ per cent. on the new £10 shares. This will require the withdrawal of £1374 from the reserve fund, which will then stand at £7128. The report expressed regret at the death of the Vice-Chairman (Mr. Briggs), and announced that Mr. G. H. Roberts had been appointed to fill the vacancy.

Water Companies.

The ordinary general meeting of the Maidstone Water Company was held last Wednesday, under the presidency of Alderman C. Ellis, J.P. The report of the Directors showed that the amount standing to the credit of the profit and loss account was £5548, out of which the Directors recommended the payment of a dividend for the past half year of 4⅝ per cent. on the original, and of 3½ per cent. on the new shares; making 8⅞ and 6¼ per cent. for the year. These payments would absorb £2075. A sum of £3350 was expended on capital account in the period covered by the report. The new pumping-station at Farstall (Aylesford) has been completed, and is working satisfactorily. The Chairman, in moving the adoption of the report, stated that the amount available for division was the largest the Company had ever made; and the dividends on the two classes of shares had now been brought level—there having hitherto been a difference in favour of the original shares. It was some comfort and consolation to the proprietors to know that the Company's water was exceedingly good, and that there was a very large quantity of it; in fact, they were capable of supplying a population twice as large as theirs was at the present time.

The Directors of the Runcorn, Halton, and Weston Water Company have issued their annual report (which will be the last one, as the undertaking has been purchased by the Runcorn Improvement Commissioners, and will come into their possession next month), in which they say the revenue account shows a balance of £1202, including a small sum brought forward from the previous half year. They recommend a dividend of 5 per cent., free of income-tax, which will absorb £750, and leave a balance of £452 to be carried forward. The capital account stands at £53,400, the revenue account at £3262, and the general statement at £1395.

The half-yearly meeting of the Stockport Water-Works Company has been held; and the statement of accounts which the Directors presented showed that there had been an increase of £623 in the receipts, while, on the other hand, the expenditure had been augmented by £566. After deducting the interest on debentures amounting to £1111, the profit on the six months' working was £8475; and this, added to the £676 brought forward, made the amount available for dividend £9151. The dividend of 6¼ per cent. which the Directors recommended, and which was agreed to, will absorb £7040, and leave a balance of £1135 to be carried to the next account. In the course of the proceedings, the Chairman (Mr. G. H. Hill), referring to the recent drought, said they had done very well in Stockport, considering the position of other towns in Lancashire and Yorkshire. He hoped they would not have to curtail their supply again in case of drought; and his reason for hoping this was that, by an arrangement with the Manchester Corporation, they would be able to get a good supply from the Manchester sources at Thirlmere and Longdendale. By a clause inserted in the Manchester Corporation Thirlmere Act, all public authorities adjoining the water-supply district of the Corporation could obtain water from them under terms dependent on the outlay incurred in bringing the water from Thirlmere, *plus* working expenses. Being the Engineer of the Thirlmere scheme, he knew something about it The whole length of the aqueduct was finished. It was 96 miles in length; and they had tested 80 miles of it. He expected that, in the course of the next six months, the whole length of the aqueduct would be completely tested. In a few months from now, they would be able to obtain Thirlmere water, which was of splendid quality. The aqueduct would convey 50 million gallons per day; but only 10 millions would be able to come through the valley. The reason the clause he had mentioned was put in the Bill was in order to carry out a suggestion made by the Duke of Richmond's Commission in 1869—that, when a long aqueduct was constructed, it should be made to benefit the whole of the country through which it passed. Oldham and other towns intended to take advantage of this clause. The terms upon which the water could be obtained from Manchester were 4½ per cent. on the cost of the works and the working expenses. In reply to questions, the Chairman added that it would be too expensive and ill-advised for the Company to construct additional reservoirs, as it would be cheaper to get a supply of water from gallons Manchester. At present they were receiving about 800,000 daily from that city.

In the report presented at the half-yearly meeting of the West Surrey Water Company last Tuesday, the Directors stated that the income for the six months, after making provision for empty houses, irrecoverable rates, &c., amounted to £3018, and the expenditure to £1291. Comparing the accounts with the corresponding period of 1892, the income exhibited an increase of £257, and the expenditure an increase of £240—the latter being caused by the severe frost of January, and the prolonged heat and dry weather of the exceptional summer. The amount available for dividend was £1806. Of this £536 would be required for the dividend on the preference shares; and from the remainder a dividend was recommended at the rate of 4½ per cent. per annum on the ordinary shares—leaving £369 to be carried forward. The issue of the £8000 additional share capital referred to in the last report, was duly applied for, and realized a premium of £494. The Directors regretted to state that, in consequence of failing health, Mr. J. Hook had resigned his position as Chairman of the Company; but they had the satisfaction of reporting that he would retain a seat at the Board. As to the works, the new engine-house was finished, and a new Worthington engine was about ready for working. On the motion of the Chairman (Mr. A. Telford Simpson), the report was adopted.

The Water Supply of Worthing.—Mr. Mansergh has presented to the Water Committee of the Worthing Corporation a report on the permanent water supply of the town. Six new sources were considered by him; and of these he has recommended one in the Findon Valley, north of Offington. He is of opinion that at least half a million gallons of water per day may be obtained there by means of adequate works; and that there need be no apprehension for a great many years to come, if at all, of the water becoming contaminated. Mr. H. Willett, F.G.S., of Brighton, has offered to bear the expense of a report from Professor Boyd Dawkins upon a site for the permanent water supply, and also the cost of such trial borings as he may suggest.

BRISTOL GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Thursday, at the Company's Offices, Canons' Marsh, Bristol—Mr. J. W. S. Dix in the chair.

The Secretary (Mr. J. Phillips) having read the notice convening the meeting, the report of the Directors, the principal features of which were given in the Journal last week, was presented.

The Chairman, in moving the adoption of the report, remarked that it did not need many observations from him, as it showed how the business of the Company was being carried on. They had not sold so much gas in the past half year as usual; and this, he believed, was the position of gas companies everywhere, and was accounted for by the phenomenal weather experienced. By careful attention, however, to their interests, the Directors were enabled to meet the shareholders with a proposition to pay the maximum dividend, and to carry forward a balance to the ensuing half-year's account. It would be interesting to them to know that the Company's sale of gas was three times what it was twenty years ago; and they would be pleased to learn that the day consumption was increasing in a way that was most gratifying to the Board. It was 25 per cent. more than before; and, with every indication of a further and steady increase, the shareholders could regard calmly and placidly the introduction of the electric light. During the year, they had proceeded with the Barton Hill gasholder tank; and it was hoped that it would be ready for use by Christmas next. The Company would then have a storeage capacity double that which they now had; and this would put them in the position of being able to meet all demands which might be made upon them.

Mr. Medway seconded the motion, and, as an ordinary shareholder, expressed the gratification generally felt at the management of the Company's affairs. He remarked that there was a disposition outside to regard the Company as a selfish monopoly, from which the consumers could not expect anything like generous treatment. It would be well for them generally to understand how well the Company had regarded them. A glance at the capital account showed that they gave to the public the use of the immense sum of £214,297, which at 5 per cent. meant £10,700 per annum. This amount was made up of the premiums which the stock yielded when put up for sale by auction. True the Company had the use of the money; but it must be remembered that no dividend was paid upon it, with the result that the public had practically the benefit of what would be the return on this sum.

Mr. Stothert thought it was extremely satisfactory that a saving had been effected in the working expenses. He hoped that, with a steady all-round improvement in the affairs of the Company, the Directors would be able to bring the price down to 2s. 8d. per 1000 cubic feet. He should like to know whether it was the intention of the Board to introduce stoking machinery. This had been done at several works, with the result of keeping down the cost of carbonizing and minimizing labour troubles. He did not see stated in the report the percentage of unaccounted-for gas.

Mr. Coslett inquired whether anyone could tell him what the expense of the electric light would be to the citizens. It was at first stated that the cost of the works would be £85,000; but now he understood that, in the opinion of those qualified to judge, the expenditure would be nearer £200,000. He thought it exceedingly hard that, as a ratepayer, he should have to pay this, and so help financially that which was calculated to injure his private interests.

The Chairman said it was clear that the civic authorities had full power to carry out, with the aid of the rates, a system of electric lighting. But he did not think it right that the ratepayers should be called upon to make good the loss in case the scheme proved unremunerative; and most certainly it did seem hard that the shareholders of the Gas Company should, as ratepayers, be forced to assist in making good the loss. As to the reduction in the price of gas, he might say that the Directors would take the first opportunity, consistent with their duty to the shareholders, to do so. With regard to leakage, he was glad to say that it was less than before; and this matter had their most careful attention. The use of gas-stoves was largely on the increase; and the Directors would charge as little as possible for them—looking for a return from the greater quantity of gas used. What Mr. Medway had said was quite right. The premiums on the gas stock sold by auction went into the Company's works, and the public had the full benefit of their earning capacity, as no dividend was ever paid upon them.

Mr. Coslett pointed out that at Cardiff, which was in the centre of the coal district, the price charged for gas was 3s. per 1000 cubic feet, as against 2s. 10d. at Bristol.

The motion was carried, as was the formal one declaring the usual dividend.

A vote of thanks was then accorded to the Chairman, Directors, and officials, and the proceedings closed.

CROYDON COMMERCIAL GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Wednesday, at the Offices, Katherine Street, Croydon—Mr. C. Hussey in the chair.

The Secretary (Mr. W. J. Russell) having read the notice convening the meeting,

The Chairman submitted the Directors' report and the accounts, which showed a sum of £18,289 available for dividend. He said he was sorry to state there was a decrease of 1·61 per cent. in the amount of gas sold. However, they were not the only Company who had suffered in this way; and it was accounted for by the extraordinary weather of the past half year—such weather as had never, in the memory of man, been known before. Regarding the capital account, it would be seen that £7883 had been spent during the six months on additions to plant. This expenditure had extended over several items; and he would give the shareholders a few to show that it had been judiciously laid out. Of the amount named, £7435 had been used in finishing the new retort-house—fitting it with a stage floor, a roof, retort-arches, and regenerative furnaces—and on account of the high-level railway extension. He mentioned on the last occasion that their Engineer (Mr. J. W. Helps) had visited a number of gas-works in which the regenerative system had been used; and he came to the conclusion that it was a proper one to adopt in their new house. Then they had purchased 5 acres of freehold land on the other side of the railway; and they had received permission from the Railway Company to construct a tunnel underneath their lines. They would, in the course of the next two or three years, require more storeage power; and they proposed to erect a holder on this land, which would be larger than any of the existing ones. The land had cost £1700; and the Directors considered they had bought it very cheaply indeed. Then on account of the enlargement of purifiers £113 had been spent; and in the extension of the purifying-shed, £181. On new mains, material, &c., £342 had been expended; on meters, £302; and on stoves, £392. They had now 7442 consumers; and the total number of stoves on hire was 2236. During the half year, they had supplied 225 additional stoves, which was a steady and satisfactory increase. They had also encouraged in all possible ways the use of the prepayment meter system. They were the pioneers of, or at all events one of the first gas companies to use, this system. It was now something like five years since they introduced it; and they found that it was very generally liked. Now turning to the revenue account, they had sold 223,721,700 cubic feet of gas; being, as already mentioned, a slight decrease of 1·61 per cent., or 3,619,500 cubic feet—equal in value to £503. An increase of £50 had been made in the rental of meters, £60 in the rental of stoves, and £21 in the rental of fittings. As to the residual products, there was an increase on coke of £398; on breeze, a decrease of £50; and on tar, a decrease of £558. This residual appeared to be going from bad to worse; and where it would end he could not say. Some companies were seriously contemplating the advisability of using it for fuel in the furnaces, rather than sell it at the present unremunerative prices. This was a matter their Engineer would also take into consideration; and he had no doubt the Directors would have the subject brought before them. Reverting to the question of the consumption of gas, the Chairman said that, although they had had a decrease in the past six months, as compared with the corresponding period last year, if they went back only five years, it would be seen that there had been an increase of something like 52 million cubic feet—showing that they had made rapid progress, and that the reduction was simply a temporary one. Turning again to financial matters, he stated that it was proposed to place £726 to the insurance fund and £108 to the reserve fund—making the former £11,840, and the latter £25,438, which was as high as they could be on the present capital. These funds, he was happy to say, were not merely on paper and being used by the Company as in the case of many other companies, but they were actually invested in Consols. In conclusion, the Chairman said he had compared some of their results with the figures given in "Field's Analysis;" and, in nearly every instance, they came out very favourably indeed. They had carbonized 21,640 tons of coal, from which the average production of gas per ton was 10,754 cubic feet; and he did not think there were more than one or two companies in the list who touched this figure. Then as to the unaccounted-for gas, this was 2·61 per cent.; while the average, he believed, was about 5 per cent. The production of coke per ton of coal carbonized was 12 cwt.; and they had realized an average of 8·38d. per cwt., which was not quite so good as last year, but a little better than the year before. Of tar, 10·19 gallons per ton of coal had been made; and it had yielded 1·2d. per gallon, which was a very low price. Sulphate of ammonia had come to their aid; it having gone up tremendously in price. The quantity produced was 225 tons, as against 196 tons; and this had realized £10 19s. 2d. per ton, as compared with £9 8s. 6d. He formally moved the resolution for the adoption of the report and accounts.

Mr. A. J. Lambert seconded the motion, which was carried.

On the proposition of Mr. W. Hyslop, seconded by Mr. J. C. Benwell, dividends were declared at the rate of 14 per cent. per annum on the capital of £51,600, and 11 per cent. on the capital of £147,500.

Mr. C. F. Hamond, M.P., in moving a vote of thanks to the Chairman and Directors, remarked upon the substantial dividends which were paid to the shareholders, and said he hoped the Directors would not think of increasing them. He trusted the time was not far distant when the Chairman would have the pleasure of announcing a reduction in the price of gas to 2s. 9d.; and, instead of taking more dividend, they should then give substantial help to the workmen's superannuation fund. As men of business, they ought never to be ungrateful to the men who produced such good returns; and they ought to do something for them when they were unable to work no more. He suggested that £300 a year would be a trifling sum to contribute to the fund, especially as he saw they were able to carry forward £6565.

Mr. M. Taylor seconded the motion, which was passed.

The Chairman, in reply, stated that the Directors had seriously thought of reducing the price of gas; but, having regard to the troublous times in the coal districts (although he did not think the present strike would be so serious as the last one), they had considered it wiser to hold on to their reserve funds, and carry a good balance forward. With regard to the superannuation fund, he stated that it cost the Company upwards of £700 to start it, and they contributed to it £130 per annum.

A vote of thanks was also passed to the officials and staff; and both Mr. Russell and Mr. Helps acknowledged it. The latter gentleman, in the course of his remarks, assured Mr. Hamond that the Directors had the interests of the men thoroughly at heart; and, in regard to the superannuation fund, although it had only been in operation a few years, there were several men who were not now capable of working, and who were receiving from it 10s. to 16s. per week.

This concluded the proceedings.

Dewsbury and Heckmondwike Water Supply.—From a statement made at the last meeting of the Dewsbury and Heckmondwike Water Board, it appears that the profit on the past year's working was £1600. Of this sum, £800 was received from the Soothill Nether Local Board, which had previously been paid to the Dewsbury Corporation. It was decided that the surplus should be divided as follows: £1200 to Dewsbury, and £400 to Heckmondwike.

BARNET DISTRICT GAS AND WATER COMPANY.

The Half-Yearly Meeting of this Company was held last Friday, at the Guildhall Tavern, Gresham Street, E.C.—Mr. JAMES GLAISHER, F.R.S., in the chair.

The SECRETARY (Mr. Alfred Lass, F.C.A.) read the notice convening the meeting; and the Directors' report and the accounts were taken as read. In the former, it was stated that the balance of the profit and loss account amounted to £15,002; and out of this the Directors recommended the declaration of a dividend, less income-tax, at the rate of 8½ per cent. per annum on the "A" and "C" stocks, 7½ per cent. per annum on the "B" stock, and £5 19s. per cent. per annum on the "D" capital.

The CHAIRMAN, in moving the adoption of the report and accounts, said that in the former was one pithy sentence—"The business of the Company continues to progress." This phrase they had now used for a good many half years; and he hoped they would have occasion to do so for a good many more. With regard to the gas undertaking, it would be noticed that they had not done so much business in gas as they did in the corresponding six months of last year. The income from private lighting amounted to £5805, which was a reduction of £149. Usually they had exceeded the receipts of the corresponding period of the preceding year; but, if they looked at the extraordinary fineness of the weather in the months of March, April, May, and June last, they would see at once the reason for the decrease. The weather was a matter about which he knew something, as he had to report upon it to the Registrar-General. The month of March was nearly 5° above its average temperature; and the following three months were somewhat alike—the evenings were bright, and light was not required until a late hour, and gas was not needed for warming. This fully accounted for the decline in the receipts from gas; but it did not affect the phrase "the business continues to progress." In public lighting there was a small increase of £20; and in meter-rental, £5. With respect to residual products, £135 more had been obtained for coke, and £77 for sulphate; but the failing points were breeze and tar. However, the net increase in the residuals (£103) went a long way to make up for the £149 lost on the gas. Tar was now a serious subject with all gas companies; ¾d. for a gallon of tar being a very small price to receive—indeed, it was a question whether it was not better to burn the tar, and so save coke, than sell it at that figure. He was surprised, considering the good pathways tar made when properly mixed with other material, that it was not in better demand for the purpose, especially in country districts. On the gas revenue account, the receipts amounted to £8246; being only £21 less than last year. On the expenditure side, he found that they did not pay so much by £141 for coal; but, as a matter of fact, they carbonized rather less than in the corresponding half of last year. The other items were very much the same as before; and the total expenditure showed an increase of £48. Therefore, the balance was only £69 smaller than in the first half of last year, nothwithstanding the extraordinary period through which they had passed. Turning to the water accounts, the receipts showed an advance of £563; but they ought not to be surprised to see an increase in the expenditure, having regard to the recent dry season. In one of his meteorological reports, he had written these words: "So that the fall of rain this year in the months of March to June is less than in any four consecutive months back to 1815, which is as far as records go in my hand." Just consider this extraordinary thing that, in the southern parts of England, less than 1 inch of rain fell in 110 consecutive days; and in that period they had to raise more water than they had ever done before in that length of time. It happened that, unfortunately, they had determined to connect their three wells together; and they experienced very great difficulty in working at the bottom of the wells, and at the same time keeping the district supplied with water. However, from what he heard, no district had been better supplied during those dry months than Barnet. The financial result was that, taking the increased expenditure and receipts together, they had a larger profit on the water undertaking by £175. In conclusion, he acknowledged the indebtedness of the Directors to the Engineer (Mr. T. H. Martin) for the able way in which he had grappled with the difficulties he had lately met with.

Mr. JOSLIN seconded the motion.

Mr. WAKEFIELD expressed the opinion that the Directors had done very well as regarded the results of the half year; but he complained, as a resident and owner of property in Finchley, of the defective supply of water during the past few months.

The CHAIRMAN denied that there had been a short supply of water; and pointed out that there had been a great waste in the watering of gardens. He hoped Finchley would take the necessary steps to have a constant supply, which would do away with all complaints.

Mr. R. H. DYER congratulated the Directors upon the state of affairs exhibited by the balance-sheet. Referring to the low price of tar, he asked the Directors to consider whether it would not be an advantage to distil it; and, with regard to ammonia, he suggested that, in the event of the price again dropping to a low figure, they should consider the advisability of producing carbonate of ammonia, which, he believed, generally realized a high price.

The motion was unanimously carried.

Resolutions were afterwards passed declaring the dividends recommended, and thanking the Chairman and Directors, and the various officials, for their services during the half year.

The proceedings then terminated.

Blandford Water-Works Company, Limited.—A Company has been registered under the above title, with a capital of £10,000, in £1 shares, to supply the town of Blandford Forum, in Dorsetshire, and the neighbourhood, with water.

Oil Lighting.—Tenders have lately been placed for lighting by oil the following towns: Buckhurst Hill and Wanstead in Essex, and Plympton and Wybridge in Devonshire. These are not new departures but in continuation of existing arrangements.

THE CRISIS IN THE COAL TRADE.

Continuing our record of the most noteworthy events in connection with the great strike of coal miners, we will commence with the district which has lately occupied so much attention—South Wales.

On Monday last week, things were comparatively quiet throughout the above-named district; the presence of the military evidently having a salutary effect. At Dowlais, all the collieries were working; and at several others work was also resumed. At the Aberdare pits the result of the ballot was declared, and showed an overwhelming majority in favour of the sliding-scale principle. In the Ebbw Vale district, matters remained quiet; and work was recommenced at most of the collieries. Owing to the small supply of coal, operations at the steel and iron works were still suspended. In the Rhondda Valley, no incident of importance occurred, with the exception of several meetings held to protest against the introduction of the extra police and military. The proposed march of 50,000 strikers on Ebbw Vale was postponed from Sunday till Monday night. The men declared that, soldiers or no soldiers, they would carry out their night march. The trade of the Swansea district was in a state of complete paralysis as the result of the coal crisis. The Council of the North Wales Miners' Federation met at Wrexham; and, after a long discussion, it was resolved that the agent for North Wales should be empowered to vote at the conference in London in favour of the men returning to work if the pits were thrown open on the old terms—the men binding themselves not to ask for an advance of wages until the prices regain the level of 1890 and 1891. Turning to Scotland, between 8000 and 9000 miners in the Fife and Kinross district struck work with the view of enforcing their demand for a 25 per cent. advance in wages. The coalowners offered the men a 12½ per cent. advance; but this they refused to accept, believing that the extraordinary demand for Fife coal in consequence of the English strike warranted the concession of the full demand made by them. The supply of steam coal failing at the docks in the East-end of London, the steamship companies sent their vessels to the Continent to coal.

On Tuesday, at the Westminster Palace Hotel, the delegates of the Federation, representing the districts of Yorkshire, Lancashire and Cheshire, Durham, Derbyshire, Monmouthshire, Notts, and North Wales, held a conference—Mr. B. Pickard, M.P., presiding—to consider what course should be taken with reference to the strike. The meeting was private; but, at the midday adjournment, there was an official communicaton to the Press. Statements were made that the miners in Durham had not carried out the resolution which was passed at the conference recently held in Birmingham; and, after a long discussion, a motion was carried excluding the delegates from that county. The Birmingham resolution was worded as follows: "That this conference is of opinion that those districts who have suffered reductions in wages, and who now are members of this Federation, should take a ballot within 14 days with a view to giving notice for an advance of wages equal to the reductions suffered during the last two years; and any district failing to comply with this resolution shall not hereafter be considered members of this Federation." In the course of an interview, Mr. J. H. Wilson, M.P. for Mid Durham, stated that the conference discussed for nearly three hours the position of Durham in relation to this resolution. He explained that the delay in taking the ballot was on account of the Durham Federation being composed of cokemen, mechanics, and enginemen as well as miners; and a vote had to be taken first on the question whether the cokemen, mechanics, and enginemen should vote with the miners on the two questions: (1) Whether the county of Durham should continue to work, or (2) strike for the 15 per cent. rise in wages. It was decided to allow the other section of the Durham Federation to vote. The ballot was in the process of being taken; and Mr. Wilson added, "Yet, in spite of the fact that we were trying to carry out the resolution of the Birmingham conference, they expelled us." At the rising of the conference, it was intimated that the afternoon had been occupied in receiving reports from districts, and that this business would be further proceeded with on the following morning. Consequently, the real business of deciding what should be the future action of the Federation with reference to the strike had not at that time been determined. Turning to South Wales, there were unmistakeable signs that the strike was dying a natural death. The march on Ebbw Vale ended most feebly; and the threats of the strikers to invade places where work had been continued, nearly all came to nothing—the presence of the military evidently checking all movements of a hostile character. The dejected appearance of the men presented a striking contrast to their bearing on the previous Thursday, when all were boisterously jubilant. At a mass meeting of miners held at Pontypridd, a Select Committee was appointed to act on behalf of the men in the existing difficulty. A conference was subsequently held at Cardiff, to draw up a basis of operations. After some discussion, the following resolution was carried: "That this Committee is of opinion that it would be advisable that all collieries that have had the offer of 20 per cent. additional advance be allowed to resume work upon the confirmation or otherwise of the mass meeting; but that no colliery should be allowed to resume operations without first applying to the Select Committee, and producing a legally-drafted agreement to that effect; and that a mass meeting be called at the Rocking Stone, Pontypridd, on Thursday next to confirm or otherwise this resolution." In the affected districts in the Aberdare Valley, everything was orderly, though the streets were still somewhat crowded with strikers. A number of hauliers resumed work; and there was a fair prospect of the strike being settled before the end of the week. A densely-crowded district meeting of colliers was held in Brynmawr, when, by a large majority, a resolution was passed to allow the men of the Hafod Ellwood Colliery to go to work, on the understanding that they are to receive the 20 per cent. advance, making their pay 31½ per cent. advance on the standard, until the general settlement. The feeling in favour of resuming work was spreading generally.

On Wednesday morning the delegates of the National Miners' Federation met again at Westminster under the presidency of Mr. B. Pickard, and deliberated in private until four o'clock; their decision being not to accept any reduction in wages—thus confirming the reso-

lution passed at the Birmingham conference. Another motion which was carried ran as follows: "That this conference hereby agrees that, subject to the coalowners withdrawing the notice for the 25 per cent. reduction in wages, we pledge ourselves to resume work at once, and not to ask for an advance in wages until prices reach the 1890 level; and that this resolution be forwarded to the Coalowners' Secretaries." With regard to affairs in South Wales, the strike there was by this time practically at an end. In almost every instance where it had been offered, the advance of 20 per cent. had been accepted; while at those collieries where the demand had not been conceded, an unconditional surrender had been made by both colliers and hauliers, and preparations were in progress for an early resumption of work. All was quiet in the Ebbw Vale district. The strikers in the Neath district, however, decided to march on the Swansea district; and this decision was carried out, though not without a serious danger of a breach of the peace. At nearly every pit passed, the strikers induced the men to stop work. In an interview with a reporter, Mr. W. Abraham, M.P., expressed the opinion that the strike would be completely at an end in about a week. In Scotland, the entire aspect of the coal crisis was changed by the concession of 1s. per day by the West of Scotland coalmasters. The advance was general in Lanarkshire and Ayrshire, although, at the meeting of the coalmasters of the latter county, the feeling was to resist the demands of the men. The following resolution passed at a meeting of dockers held in London is worth placing on record: "That this meeting of dockers (E.C.) hereby express the deepest sympathy with the miners, believing their attitude to be the only one, and economically sound—*i.e.*, (*a*) that it is the only prevention of stock gambling and starvation wages; (*b*) that we consider the steps taken by the employers to be an effort to crush out Trade Unionism, and to incidentally ruin small competitors; and (*c*) that we consider the latest act of capitalistic terrorism as unscrupulous, menacing the commercial prosperity of our country, paralyzing trade, using the undoubted advantage of their commercial position to blackmail industrially other trades which make up our industrial economy. We therefore offer our best sympathy, and trust that Northumberland and Durham, now standing aloof while their fellows are fighting the miners' battle, as well as the Welsh non-unionist miners, will rally to the aid of their fellows, and release themselves from the bondage of the sliding scale, where its conditions are enforced by prison and magistrate—these conditions being incompatible with democracy and justice. We trust to see the nefarious conspiracy of capitalists defeated by the sturdy resistance of all affected by the dispute; and we strongly protest against the increasing number of military employed in trade disputes—we condemning the Government as directly inciting to riot and social disorder, because the military officers use their class hatred to actual murder and class war. We hereby call upon all workers to strenuously resist the capitalistic conspiracy of employer, magistrate, military, and Government to crush out the progressive movement of the democracy."

Judging by the course of events during the preceding days, it was quite expected that the strike in South Wales would be at an end by Thursday. This, however, was not the case. It is true that the men had returned to work in several collieries; and by the evening of that day, the output was from 20 to 25 per cent. of the normal quantity. But the conflict was by no means over. In accordance with the resolution come to, there was a meeting of hauliers and colliers at the Rocking Stone, Pontypridd, at which about 6000 (although the official record put it at 29,000 or 30,000) men were present. The first motion submitted—which was to the effect that the resolution passed by the Central Committee at Cardiff on Tuesday, recommending all colliers to return to work where the 20 per cent. was conceded, be confirmed—was rejected in favour of an amendment calling upon those then at work to come out and join the ranks of those who were fighting for their rights. In fact, only about half-a-dozen hands were held up for the original proposition. A private meeting of hauliers also took place, the delegates at which (representing some 15,000 men) declared most emphatically against going to work. At Aberdare, there was a well-attended meeting of members of the Committees of the different collieries in the district not at work; and a resolution was passed by a considerable majority to resume on the following day. All was quiet at Swansea during Thursday. The police were on the alert; but the strikers did not pay their promised visit to the town in large numbers. As a result of the demonstration on the part of the strikers in the vicinity of the town, 500 men employed at the Copper Pit colliery refused to work, not because they were afraid of the strikers, but because they would not work under police protection. The colliers employed at other pits in the Swansea district which the strikers visited on the previous day also failed to put in an appearance. It was expected that the strikers would march through the Amman Valley and Llangelly, intent upon constraining the anthracite colliers, who along the line number fully 10,000, to cease working. As, however, an adverse feeling existed there, the proposed invasion was abandoned. At a mass meeting of anthracite miners, held at Crosshands, near Llanelly, the following resolution was unanimously carried: "That this mass meeting of anthracite miners and other colliery workmen desire to express our unabated confidence in the principles of the sliding scale, and in our leader Mr. W. Abraham, M.P., and all his colleagues on the Sliding-Scale Committee, and also are determined not to be forced to leave work, whoever may come here to make the attempt." Great disappointment was expressed by the Derbyshire miners at the result of the London conference. They said they did not believe the proposed compromise would be accepted by the employers; and, although the men appeared as determined as ever in their resistance to the demands of the coalowners, the distress among the women and children was becoming very acute. It was estimated that something like 40,000 men were idle in the county. In Durham, the action of the Miners' Federation in expelling the Durham agents from the London conference was greatly resented; and a feeling antagonistic to the Federation was consequently engendered.

Matters in South Wales were tolerably quiet on Friday; and a few more collieries resumed operations in the morning. In some districts, however, the men expressed their determination not to give way. In the Aberdare Valley, affairs were more hopeful; 20 collieries out of 24 having resumed work. In the Merthyr Valley, all the pits were employed. The Executive Committee appointed by the strikers at the meeting at Pontypridd on the 14th inst. issued a long manifesto in defence of their action. In the course of it they said: "The masters claim the right, and have exercised it in many cases, to give a month's notice to stop their collieries when they were working at a loss; and if that right belongs to them, why, in the name of reason, cannot we stop for the reason that our wages are not nearly sufficient to support ourselves and families with the necessaries of life? We are blamed for not giving a month's notice; but if the sliding scale binds us until September, 1894, of what value can a month's notice be?" They concluded by calling upon the men to be united in their action and firm in their demands, in the consciousness that their claims were just and right. The miners on strike in the Staffordshire Potteries evinced a very turbulent spirit on Thursday and Friday, and did a good deal of damage. Great excitement prevailed, and orders were sent to Chester for military assistance. It was thought that, if the strike lasted much longer, North Staffordshire would suffer as keenly as any other part of the country. Some manufacturers had already notified the necessity of stopping their works for want of coal; and others would be compelled to close in a week unless the miners resumed work. In the Ashton-under-Lyne district, the stoppage of collieries had caused several mills to run short time for want of coal.

There was practically no change in the position of affairs in South Wales on Saturday. Ballots took place in several districts; the result being in favour of resuming work. The Northumberland miners have not only refused to strike to obtain the increase of wages which they applied for at the instance of the Federation, but have resolved not to pay any levy towards the support of the men on strike. The ballot at the collieries in East Durham shows without doubt that, according to the published results, the men have decided by a large majority to insist upon an advance of 15 per cent. or a strike. No returns in Mid or West Durham have yet been made known. Prices of coal are increasing in the district. The miners in North-West Durham are adverse to a strike. The spirit of lawlessness manifested in the Staffordshire Potteries district has been effectually checked.

Under the auspices of the London Vigilance Committee, five meetings were held on Sunday in central places; all of them being close to points where the coal industry is carried on. At the St. Pancras arches, in the forenoon, the President of the Coal Porters' Union (Mr. Harry Brill) took the chair, and strong speeches were made in support of the miners. Also in the forenoon, a well-attended meeting was held in Southwark Park, where Mr. R. H. Fairbairn, the President of the Society of Lightermen and Watermen, presided. Mr. Shaw Maxwell made a strong appeal for moral and pecuniary help for the miners. In the afternoon, Deptford Broadway was packed by an enthusiastic crowd, presided over by Mr. C. Heath, the Assistant-Secretary of the Coal Porters' Union, and speeches in support of the miners were made. Later on, in the evening, at the top of Peckham Rye, there was a large muster of sympathizers with the miners. Finsbury Park was also the scene of an evening meeting. At all the gatherings, a resolution of sympathy and support for the miners was passed; but in the case of the Southwark Park meeting the following addendum was made: "And we hereby warn the present Government that all attempts to flood with troops the mining districts at the bidding of the Magistrates will be remembered against them at the next election."

Taking advantage of the strike clause in their contracts, coal merchants generally ceased to deliver supplies at gas and other large works on the occurrence of the strike, now more than a month ago. As the result, many industrial concerns in different parts of the country have either closed entirely or have curtailed their operations. Fortunately for those concerned in the management of gas undertakings, as for the average householder, the strike has occurred at a time when the demand for coal is at a minimum. The continuance of the stoppage is nevertheless a cause for some anxiety; and, in individual cases, it will, no doubt, add very considerably to the troubles of the gas manager. At Oldham last Wednesday, Mr. Chadwick reported to the Gas Committee that, although there were six or seven weeks' supply of coal in stock, the bulk of it was at the Higginshaw and Hollinwood stations. The quantity in store at the Oldham works was so small that, unless it could be replenished, these works would have to be closed in a week. Some members of the Committee expressed surprise on being informed that no deliveries of coal were being made under the contracts; and apparently heard for the first time that there was a strike clause. A conversation took place as to the best course to pursue under the circumstances; the result being that the Committee decided to "risk it for a fortnight," or, in other words, to leave the consideration of the question of fresh supplies over till the next meeting. In the meantime, Mr. Chadwick has to face the awkward position that there is little or no coal to supply the requirements of one of his three works.

THE GAS SUPPLY OF TORONTO.

A recent number of the *Toronto World* contained some particulars of the work of the General Manager of the Toronto Consumers' Gas Company (Mr. W. H. Pearson) in providing for the requirements of the gas consumers of the city. They were furnished to a representative of that paper, and were duly chronicled with all the picturesqueness of language for which the American interviewer is celebrated.

From the account, we learn that never before has so much gas been consumed in Toronto as there is to-day; and that never were the prospects more promising for a big consumption in the future. The Directors a few months ago made a considerable reduction in the price of gas; bringing the charges down to $1 per 1000 cubic feet for illuminating, and to 90 c. for cooking purposes. The result has proved eminently satisfactory. During the month of June alone, 500 additional cooking-stoves were fitted up, and drew their daily supplies of gas from the Company's mains. Of course, this additional demand has to be met; and a large part of Mr. Pearson's time is occupied in providing plant to satisfy the requirements of the immediate future. It is only five years since the first big gasholder was constructed. It has a

capacity of 1,160,000 cubic feet; and up to a recent time it was by far the largest holder in Canada. It is in two lifts, each 35 feet deep; and it works in a tank 150 feet in diameter and 35 ft. 9 in. deep. The total height from the ground to the top of the crown is 77 feet. The guide-framing is composed of 16 standards, each 74 feet in height. Large as the holder is, it is inadequate, with those previously constructed, to supply the increasing demand for gas; and the Company have for the past eighteen months been erecting a second one of far greater proportions. It rises 112 feet above the ground; being 35 feet higher than the one alongside it. Its capacity is 1,750,000 cubic feet, or about 50 per cent. more than the other. This is the largest holder in Canada; and there are not many to exceed it in the United States. The tank was designed by Mr. Pearson; and it was constructed under his superintendence by Mr. W. C. Whyte, of New York. Early in the spring, everything was ready for the contractors for the holder (Messrs. R. D. Wood and Co., of Philadelphia). The work of construction, which was entrusted to Mr. H. A. Carpenter, was commenced on May 15; and the holder was to be completed by the 1st inst. The framework consists of 16 columns 108 feet high, connected by three rows of lattice girders. No bolts have been used for putting it together; this having been done with hot rivets. Although much less steel has been used than would have been employed by some of the competing firms, the contractors claim that equal security will be ensured by their method of disposing of the various parts of the framing. The holder is in three lifts, each 35 feet high; the diameter of the inner lift being 144 feet, and that of the outer lift 148 feet. The crown has a rise of 7 feet. The cost of the holder and tank has been about $100,000. By their completion, the Company's storeage capacity will be brought up to nearly 4 million cubic feet. The gas is conveyed to the holders by a 20-inch main, about two miles in length; and it is employed in the lighting of the western and central districts of the city. Such is the rate of increase in the consumption, that Mr. Pearson anticipates that in about three or four years' time a further enlargement of the present storeage plant will be necessary; and he thinks the next holder to be put up will be located in the eastern district. The Company's output of gas last year was somewhere about 560 million cubic feet.

BINGLEY IMPROVEMENT COMMISSIONERS' GAS UNDERTAKING.

The Past Year's Operations—A Reduction in Price.

At the Meeting of the Bingley Improvement Commissioners yesterday week, Mr. Gatecliff, in moving the adoption of the minutes of the Gas Committee, made his annual statement upon the working of the department. He said that during the year 58,083,300 cubic feet of gas had been made—being an increase of about 1,000,000 feet upon the previous year. The leakage had amounted to 3,436,300 cubic feet, or equal to 5·91 per cent., which was a reduction compared with the preceding twelve months. This decrease was due to the renewals which had been made in the gas plant, and also to the greater consumption in the daytime. The amount received from the sale of gas was £9003; from coke, £1315; and from tar and liquor, £589—the last amount being fully 4s. per ton less than that obtained in 1891-2. Repairs and renewals had cost £557, as against £858 the year before. The gross profits had amounted to £2776; and the net profits, after paying £1074 as interest upon loans and £1166 to the sinking fund, were £536. The capital repaid amounted to £25,029; and there yet remained to be repaid £24,978. The estimated value of the plant was £36,500, taking a low estimate; and the reserve fund stood at £1604. He proceeded to refer particularly to the success which had attended the efforts of the Committee in fostering the use of gas for domestic purposes in the daytime, whereby a great increase in the consumption of gas had been obtained; and he expressed the confident hope that the consumption for such purposes would show a much larger increase during the current year. Mr. Gatecliff also went into details to show that at present the interest on the reserve and sinking funds and other gas moneys, instead of being included within the finances of the undertaking, went to the benefit of the general fund of the Commissioners; and he expressed the opinion that the Gas Department ought to stand on its own footing, and that a resolution passed a few years ago, that the profits should be utilized for gas-works purposes, should be rigidly adhered to. In concluding, he said that the Committee recommended that the price of gas supplied to engines should be reduced by 4d. per 1000 cubic feet, and should thus be brought to the same level as cooking-stoves and other domestic appliances; that the Bingley Township Local Board should be supplied with gas for public lighting at the same rate as was charged within the Commissioners' district; and that the price of gas all round should be lowered 2d. per 1000 cubic feet. He thought, too, it would be only a grateful token of their appreciation of the services of their Gas Manager (Mr. G. D. Malam) to add something to his stipend. He had very good results to show. Under his management the works had been turned from a losing concern into a profitable one. He had enabled the gas to be reduced in price from 5s. to 2s. 6d. per 1000 cubic feet; and his services were worthy of special recognition, and such recognition would do credit to them as a public body. In the discussion which followed, the members generally approved of the reduction in the price being made, though a few urged that a decision should not be arrived at until the next meeting, when the members would know better the position of affairs in the coal trade. Mr. Gatecliff, in reply, said the Committee were unanimous in recommending the reductions; and, in their consideration of the matter, they had paid due regard to the probable effects of the coal strike. Their contracts for the year's supply had been made at 1s. per ton less than the previous rates; and there was every prospect of a considerable increase in the consumption of gas. They had enough coal stocked to last for several weeks, even if supplies should be entirely stopped; but they were at present receiving regularly as much coal as they required every week. The minutes and recommendations were adopted.

LEICESTER ELECTRIC LIGHTING SCHEME.

Local Government Board Inquiry.

At Leicester last Friday week, Major-General Crozier, R.E., held an inquiry relative to the application of the Corporation to the Local Government Board for permission to borrow £50,000 for carrying out their electric lighting scheme. In opening the case for the applicants, the Town Clerk (Mr. John Storey) said that, although the amount asked for was a large one, it was not an excessive sum for the purpose. Leicester had advanced in population, wealth, and prosperity at as great, or perhaps a greater rate than other large towns in the kingdom; and the Council were sure the time had arrived when electric lighting must be dealt with. The line of the Corporation was decisive; and they believed they represented the ratepayers of the town, though they were opposed by the Ratepayers' Association. He gave an outline as to what the Council had done, and how they at present stood, in connection with the question. The Gas Committee, who had the matter in hand, recommended the acceptance of a scheme proposed by the Brush Company, whose tender amounted to £26,977. This had been favourably reported upon by Professor Kennedy; and the Council had adopted it. To the amount of the tender had to be added the necessary buildings which would have to be erected, and which the Gas Engineer (Mr. Alfred Colson) estimated would cost £4000. This would make a sum of £30,977. The Corporation suggested 10 per cent. for contingencies; and this would leave a balance of £15,926 available for future capital for use in the extension of the mains and apparatus. The Provisional Order gave no borrowing power, nor did it sanction the use of any Corporation land; so that the application was for two purposes—to borrow money and to utilize land. The Corporation were of opinion that they, as the lighting authority, should carry out the electric lighting. If they did not supply the light, someone else would; and it would be a serious mistake to allow a private company to come into the town and control the electric lighting for a period of 42 years. The Corporation had had some bitter experience of private companies. They allowed a Company to supply gas in Leicester for many years; and they flourished until 1878, when they had a capital of £220,000. The Corporation then bought up the concern, paying £476,650, or a premium of 116 per cent., for compulsory purchase. They also allowed a Company to take up the supply of water for Leicester; and they also prospered, until, in the same year, they had a capital of £230,000. The Corporation acquired that concern at a cost of £452,424, or a premium of 97 per cent. There were those who were afraid that the Corporation were running considerable risk, and that the town would sustain loss by the enterprise. But instead of that, during the 15 years that had passed since then, the Committees had been ably to apply considerable sums each year to the relief of the rates. If some other Company were allowed to step in, it would imperil a capital of £800,000 which was invested in the gas undertaking; and, in spite of the fact that the system was expected to be improved as years went on, it was sufficiently established to warrant them in expending the capital. Evidence was then called; the first witness being Mr. Colson, who described in detail the scheme and the cost of the various items of machinery. Among other witnesses was Alderman Lennard, the Chairman of the Gas Committee, who stated that, without any canvass, they had received applications for about 4000 lights as soon as they were able to establish them; and that the first portion of the machinery which they proposed putting down would supply 7200 16-candle power lamps. The policy of the Committee would be not to hamper the success of the electric light by loading it with profit; but to charge as low a price as possible. His own opinion was that they would start with a charge of 6d. per unit. The balance of £16,000 it was expected would cover all other necessary things—such as meters, &c. Replying to the Inspector, he admitted that no estimate had been made in regard to meters; and also that it was not proposed at present to employ electricity for the purpose of public lighting. Witness was questioned by Mr. Wright, on behalf of the Ratepayers' Association, as to why the Corporation did not accept Mr. Ferranti's tender, which was £4000 less than that of the Brush Company. He replied that the Committee had their reasons for not doing so; and the Inspector settled the matter by pointing out that it was not his business to inquire into the tenders. Mr. Banton, on behalf of the local Trades Council, spoke in favour of the application. Later in the proceedings, Mr. Colson, referring to the £16,000 previously mentioned, stated that he estimated they would require 600 meters, which, at £5 each, would amount to £3000; 600 connections at £2 10s., £1500; and exciters and conductors, £3000. He also named other incidental expenses which brought up the total to £8500. Mr. Wright then addressed the Inspector in opposition to the scheme, and introduced a number of figures relating to the borough debt and the rates. He believed it was the opinion of the ratepayers that the present time was inopportune for the scheme; and they were convinced that a company could produce the light at a less cost than the Corporation. Then, too, they thought it would be better to have the works near the centre of the town rather than at Aylestone. They did not object to the light; but they asked that its installation should be put off for another five years, until the town was in a more flourishing state. The Inspector, however, pointed out, before the proceedings closed, that, if there was any delay, the Corporation would lay themselves open to the possibility of losing their Order.

Electric Lighting for Harrogate.—The time having expired within which the Harrogate Corporation should have complied with the Provisional Order granted them by the Board of Trade, and supplied the specified compulsory area with electricity, the General Purposes Committee have advised them to at once take steps to carry out the work, before their powers lapse. This has been agreed to; and, as soon as a scheme has been adopted, and the sanction of the Board of Trade obtained, a loan will be applied for.

SOME NOTES FROM AMERICA.

By Our Own Correspondent.

The downward tendency in the price of gas, around and about Boston, continues; and this time it is the Brookline Company which is forced to reduce, and the Gas Commissioners are the compelling power. Brookline, it should be said, is a suburb of Boston; and, geographically, it is a part of the latter city—that is to say, as the City of Boston from time to time reached out, and absorbed the outlying villages and towns, it was not long before Brookline was reached. But that town, first and always, has declined to give up its independence, and has rejected all offers to be merged in the City of Boston. The latter city has, however, conquered towns beyond Brookline; so that the latter is fairly encircled by the city, but still, is not, governmentally, a part thereof. The Brookline Gas Company, besides supplying the town from which it takes its name, also lights what was formerly Brighton, but is now a portion of Boston. It has thus been of late a disturbing factor in the gas question of the "Hub;" and its power to make trouble has been much increased by the backing it is supposed to have secured from parties interested in the Standard Oil Company.

The Brookline Company have lately reduced to $1 per 1000 cubic feet the price of gas in the City of Boston, where their mains are now being laid in quest of new business, which it is hoped will be obtained from the Bay State Gas Company. But the figure ruling in Brookline has been $1·50, which was reduced from $1·90; and it was against this discrimination that a protest was made to the Gas Commissioners. In their answer, the Board place the price at $1·40. The Commissioners, in giving their decision, say:

The Brookline Gas Company, which began to supply gas in 1853, has had a monopoly of the business in that town and the Brighton district. . . . The petitioners urge that they should have gas at not more than $1 per 1000 feet, and base their claim upon the ground that the discrimination against them in the lower price made for Boston ($1) was both illegal and unjust; and, further, that the price named in the Boston contract, being a voluntary act of the officers of the Company, was ample and conclusive evidence of its ability to supply gas at that rate with a fair profit. But little effort was made by the Company to justify the discrimination in this case, except by an intimation that it was fairly based upon a difference in cost of distribution, caused by the difference in density of the gas-consuming population.

It is very doubtful if any such difference in cost could be shown to exist; and if any did appear, it would probably be found too small to have any appreciable effect upon the selling price of the gas. It would be a theoretical difference, rather than a practical one. Certainly, the difference in this case is too great to be justified upon such grounds, since it is more than three times the entire cost for distribution. A distinction of this character between customers has been generally regarded as contrary to a sound public policy, and has never been employed except as a temporary expedient.

But while such discrimination may appear to be unjust, it is by no means clear that it is illegal; and it is not every case of discrimination that either this Board or the Courts can interfere to prevent or adjust. There is no law to prohibit a company from selling gas at less than cost, or perhaps, from giving it away, if it considers such course desirable; and no power lies with this Board to increase the price, unless upon application of the company itself. Whether the Board can prevent this discrimination, depends upon whether it has the power to reduce the price in the territory named to $1 per 1000 feet—whether, in fact, the Brookline Company can supply gas at $1 per 1000 feet, and pay a fair dividend upon the capital necessary for the business. Unless it can do this, no power exists, either in the Board or elsewhere, to compel it to supply it at that price. The Board cannot assume, merely because the Company offers to supply gas under existing conditions in Boston at $1 per 1000 feet, that it can fairly afford to supply it at that price, either there or elsewhere. It would be as reasonable to assume, it could not afford to supply in Brighton at less than $1·50, since that is the price named in the contract for that district. All the evidence in the possession of the Board tends to shows that until the conditions shall be greatly changed, the Company cannot be legally required to supply gas in any portion of its territory, for $1 per 1000 cubic feet. All its accounts show that this price is less than cost, and would provide nothing for either interest or dividends. It was contended that this district should not be chargeable with the capital invested in the prosecution of the recent Boston contract, the electric light business of the Company, or in the property formerly used for the gas business, but now abandoned. This seemed to the Board to be a fair position, and in harmony with its previous policy. If the Company sees fit to carry, for any length of time, real estate not suitable for the business of supplying gas, and which it never intends or expects to use for such business, it would seem fair that the burden of such ownership should be borne by the property itself, and not by the consumers of gas. It may well be claimed that the Company is under obligation to its consumers, having disposed of such property, to apply the proceeds to a reduction of its capital. There seems to be no good reason why the surplus profits of the gas business should be used to support the electrical enterprise, or that gas consumers should in any way be asked to bear the burdens properly belonging to those who desire the luxury of the electric light.

Prior to entering upon the expenditure necessary under the Boston contract, the bond and share capital of the Company was $1,000,000. Deducting from this the investment in the electric business, and in the property abandoned, the capital employed is still high, relative to the Company's output—very much higher, indeed, than in the case of any other company within the Commonwealth with which it may fairly and properly be compared; higher, with one or two exceptions, than any other dividend-paying company. Apparently the Company has been burdened through a considerable portion of its history by a lack of economy in its management; since the prices charged for gas in the past seem to have been sufficient to provide a liberal profit. The Board confidently believes that with the proper improvement possible in respect to management and leakage, and the entire cost of the gas thereby reduced to the lowest point which can reasonably be demanded of the Company, it will be able to earn a fair, though moderate, dividend upon the capital actually invested for the supply of gas in Brookline and Brighton.

I have given the decision of the Board thus fully, as the question involved was very interesting; and at the first blush it was thought they would be compelled to make a uniform price in both territories. This, it appears, is not to be; but, from the closing of the decision, it is clear that the Board does not feel that the Company will make very heavy profits at the figure allowed. The price is higher than is permitted in other suburbs where appeal has been made. Thus the Roxbury Company is required to furnish gas at $1·20; while the Dorchester and South Boston Companies are allowed to charge $1·30. All of these sections bear geographically a similar relation to Boston as Brookline, save that they are included in the Municipality. However, it is to be noted, that Brookline has a larger proportion of wealthy inhabitants; and having many extensive estates, the main mileage is relatively greater than in the other suburbs. This is shown by the gas sold per mile of main, and the number of customers by the same standard. Thus Brookline sells about 880,000 cubic feet per mile of main; customers per mile, 31·4; gas sold per customer, 28,269 cubic feet. In Dorchester, the gas sold per mile of main is 1,113,757 cubic feet; customers per same standard, 57·2; gas sold per customer, 19,460 feet. In Roxbury, the gas sold per mile of main is 2,254,080 feet; customers per same standard, 110·3; gas sold per customer, 20,432 feet.

In the meanwhile, the Brookline Company are making additions to their works, in anticipation of the increased business it is hoped will be secured in Boston. This must mean practically new gas-works, as the Company had, or in fact has now, a very small output—scarcely 60 millions a year, and the new works are stated to be of 1 million feet daily capacity, Gas will be made by the water-gas process in the new plant.

The Boston Gas Company have now practically abandoned the manufacture of coal gas, having closed up their extensive coal gas plant at "Commercial Point," and reopened the old "North End" works, where they are making water gas exclusively. It is stated that the Bay State or Boston Company's earnings are comparing well with a year ago, notwithstanding the reduction in price to $1.

Apropos of Boston, it may be mentioned that, at the last session of the Massachusetts Legislature, many laws and amendments to present statutes were proposed, but few were enacted. An amendment to the Municipal Lighting Act was passed; but while it changes somewhat the method to be pursued in valuing a lighting plant taken by a city—throwing out the clause which requires the Commissioners who appraise the plant to value it on a basis of the franchise involved—still the amendment falls so far short of the injustice aimed at that the lighting companies should be thankful the statute is no worse. The aim of the advocates of municipal lighting is to have the law so changed that a city or town can take up electric or gas lighting, and enter into competition with established companies. This is so manifestly unjust, after the light companies have invested their money in good faith, that it is to be hoped the amendment will fail as often as it is introduced. But of this there is no surety.

Another addition has been made to the list of Gas Managers' Associations, by the formation of the Pacific Coast Gas Association, recently founded at San Francisco, California. Generally speaking, one cannot but help thinking the best interests of the gas industry are served by building up, and binding together in mutuality of interest and work, the Associations already existing, rather than in forming new ones. But the territory covered by this new Society is separated so far from the centres of all other Associations—not only in actual miles, but also by the Rocky Mountains and the Colorado or American Desert—that it is certainly fitting the gas engineers of that locality should have a gathering of their own. Moreover, they have many problems to solve peculiar to their own locality. One can realize this when reading the discussion which they had at the first meeting of the Society upon Japan coals. Not many people certainly will stop to think of the fact that on the Pacific coast coal can be imported cheaper than it can be transported across the mountains. Yet such is the fact. The Society had an interesting discussion on the electric light and gas question—as to whether they were friends or foes. The discussion was on the lines usually followed, and tended to show (as in past instances) that an answer to the question cannot be given which will be applicable to all places. Circumstances alter cases.

Another decision has recently been given in favour of the Edison lamp. This time, the seat of action is the United States Circuit Court, at Milwaukee, Wisconsin; and it is chiefly of interest as the defendants relied largely for their answer upon the Goebel lamp. This is the third suit in which the same defence has been brought forward; and it is the second instance in which it has not proved of sufficient weight to prevent an injunction against the infringing lamp. It is also worthy of note that several temporary injunctions have been obtained by the Edison Electric Illuminating Company of New York against parties in the city having isolated plants, and using other lamps. These cases are of interest, as they are the first ones brought by a sub-Edison Company, or licensee. Hitherto, the suits have been brought by the parent Company.

THE EXTENSIVE NEW WATER SCHEME FOR BELFAST.

As recorded in our "Parliamentary Intelligence" on the 1st inst., the Bill of the Belfast City and District Water Commissioners received the Royal Assent during the preceding week. This measure is the most important of the session so far as water supply is concerned—granting as it does powers to borrow no less a sum than £875,000 for the construction of new works. The supply is to be obtained from the Mourne Mountains, some few miles above the neighbourhood of Kilkeel, County Down. The Commissioners were well advised before finally selecting this from other available sources. The area was thoroughly investigated by their own Engineer (Mr. L. L. Macassey, M.Inst.C.E., who is also a Barrister-at-Law) and the firm of Messrs. Leslie and Reid, MM.Inst.C.E.; and the suitability of the water for domestic purposes was testified to by Professor Dewar. Under the Act, the Commissioners are empowered to intercept the waters of the Kilkeel and Annalong rivers. The former will be intercepted in what is known as the "Silent Valley," by means of a large storeage reservoir, which will hold upwards of 2000 million gallons of water. The reservoir will be formed by means of a substantial earthen embankment across the valley, which will be left wide enough on the top to provide for future enlargement. The water slope of the bank will be faced with heavy granite rubble pitching, and the outer slope soiled.

For the purpose of protecting the embankment from injury during construction, an outlet tunnel will be made past the end of the bank, having an area of 99 square feet, and a flood capacity equal to 364 million gallons per day. A storm overflow weir and waste channel will also be constructed for the permanent safety of the reservoir, having a flood capacity of 1530 million gallons per day. The supply from this reservoir will be regulated by an elaborate system of outlet-valves erected on a large water-tower with stand-pipes. This will allow the water to be drawn off in large or small quantities into the main gravitating conduit, which will commence at the outer end of the embankment, and continue along the mountain slopes into the adjoining valley, where the Annalong river will for the present time be brought under partial control by means of a weir and branch conduit leading into the main conduit from the Silent Valley reservoir. The main conduit will then be continued in "cut and cover" along the mountain slopes to near Newcastle, where it will pass through the slopes of Slieve Donard and St. Thomas Mountains in a tunnel some two miles long, with an area of about 30 square feet and a water capacity of 30 million gallons per day. From this point the water will be carried through a single line of cast-iron and steel syphon-pipes across the low-lying lands, passing close to Maghera, Castlewellan, and Annsborough. The capacity of this syphon will be 10 million gallons per day. From this point the work will continue in "cut and cover" along the higher districts of country to near Ballynahinch, where several short lines of syphons will be necessary in low ground and valleys, and finally passing through the high and uneven piece of country in the neighbourhood of the "Temple" by cut-and-cover and tunnel work. The main conduit will terminate, after traversing a distance of nearly 35 miles, in a new service reservoir at Carryduff. This will be constructed in the usual way, having an elaborate and extensive system of straining and outlet towers, and a storeage capacity of nearly 100 million gallons, which will be sufficient for the present demands of the city; and it will be situated at such a high level as will give a high-pressure supply to the most elevated districts within the Commissioners' area. The catchment area from which the water in the Mourne district will be collected is nearly 9000 acres in extent, and is of the most suitable kind for giving an ample and very pure supply of water, as the mountains, rising to almost 3000 feet above sea-level, are rugged and steep, free from cultivation and pollution of any kind, uninhabited, and lying close to the sea. Besides, to preserve the purity of the watershed, the Commissioners have obtained powers to purchase the entire catchment area; and this will prevent any possibility of cultivation or pollution in the future. It is not intended at the present time to bring in the full available supply; but the present works will be limited to the first of three instalments of 10 million gallons per day each, so as to meet the existing demands of the city. The quality of the Mourne water is, generally speaking, soft, but not so soft as the Loch Katrine water; it is somewhat brighter in colour, and will not, it is said, be affected by lead. The owners of property and the occupying tenants along the banks of the river and in the catchment area have been settled with on most satisfactory terms—the claims of only one large proprietor remaining over for arbitration. The cost of obtaining the Act will be about £3000.

THE WATER SUPPLY OF KENDAL.

Projected Auxiliary Supply from the Manchester Corporation.

An important step has been taken by the Kendal Gas and Water Company, with a view to the augmentation of their water supply. A deputation representing the Company waited last week on Alderman Sir J. Harwood and Alderman B. Leech, the Chairman and Deputy-Chairman of the Manchester Water Committee, to ascertain whether the Committee would entertain an application for a supply of water to them by tapping the mains from Thirlmere which pass through Kendal. The diplomatic reply was that, if such an application were made, the Water Committee would consider it. In explanation of the interview, it may be necessary to state that serious complaints have of late been made as to the quality and quantity of the water supplied by the Company. At their last meeting, the Kendal Town Council decided to have analyses made of water taken from the mains; and the result has been received. Mr. R. Hellon, of Whitehaven, the County Analyst, says the four samples submitted to him show considerable difference in quality, varying from a very good water to one of doubtful purity. The very worst of these samples is, however, not so bad as the best of three others taken from the river and analyzed by him a month ago. In view of the fact that the drainage from several cottages and large manure heaps enters the river from which the water is taken, Mr. Hellon adds that he "cannot regard this as being perfectly safe water." Reference to the subject of the water supply was made at the recent meeting of the Company. The Chairman (Mr. W. D. Crewdson) explained that, owing to the excessive drought, it had been necessary to resort to the River Mint for a portion of the supply. They had had an analysis made by Mr. Pattinson, of Newcastle-on-Tyne, which told them that, although the water was not very nice to look at, it was wholesome, and might safely be used for domestic purposes. Mr. Crewdson added that there was much waste of water in the district. The Company had been sending out 30 gallons per head per day; and if the waste were prevented, as they hoped it would be by the measures they were taking, the supply of water from sources other than the river would be ample. This statement was criticized by some of the shareholders, who suggested that the time had arrived when a better and more certain source should be provided. It is, of course, with a view to securing this that the Company have now approached the Manchester Corporation. The negotiations are likely to give rise to an interesting question. Although certain rights and privileges were secured during the passing of the Thirlmere Act by the districts through which the mains run, or in which portions of the undertaking are situated, the Corporation cannot, it is asserted, be compelled to furnish water to a private company, although the company may themselves be under statutory obligation to supply the district affected by the works. The Manchester Corporation, however, do already sell water to the Stockport Company; and the probability is that their general powers will enable them to make similar concessions in other cases.

METROPOLIS WATER SUPPLY.

The Quality of the Water in the Month of July.

The returns furnished to the Registrar-General by the London Water Companies as to the water supply of the Metropolis during the month of July show that the average daily supply was 206,897,592 gallons, as compared with 199,650,507 gallons in the corresponding month of 1892. The number of services being 796,127, the rate was 260 gallons per service. Of the entire bulk of water sent out, 105,873,601 gallons were drawn from the Thames, and 101,023,991 gallons from the Lea and other sources. Reporting upon the quality of the supply, Dr. E. Frankland said: "Taking the average amount of organic impurity in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies and by the Tottenham Local Board of Health was: Kent and New River, 0·7; Tottenham, 1·3; Colne Valley, 1·5; East London (deep well), 1·7; Lambeth and East London (river supply), 1·9; West Middlesex, 2·1; Chelsea, 2·3; Southwark, 2·4; and Grand Junction,* 2·5. The unfiltered river waters contained the following proportions: New River Cut, 1·9; East London Company's intake, 3; and the Thames at Hampton, 4·5. The Thames at Hampton was, on July 19, turbid and of a pale yellow colour. It was, both chemically and bacterially, in a somewhat better condition than on the 20th of June last. Contrasted with the unfiltered water, the supplies of the five Companies drawing from the Thames showed great chemical, and the following percentage bacterial, improvement: Chelsea, 99·39; West Middlesex, 99·53; Southwark (filter No. 2), 99·72; Grand Junction (Hampton filters), 98·22; and Lambeth, 98·73. The water was in every case efficiently filtered. The unfiltered water, taken chiefly from the River Lea by the New River Company on July 20, was chemically superior, but bacterially much inferior in quality, to that collected on the 22nd of June last. It was turbid and very pale yellow; but, before being supplied, it was improved bacterially to the extent of 99·06 per cent., and ranked, as regards chemical purity, with the best of the deep-well waters. It was efficiently filtered before delivery. The raw water taken from the Lea by the East London Company on July 20 was turbid and pale yellow. It was chemically of better, but bacterially of much worse, quality than when examined on the 22nd of June last. It was efficiently filtered before delivery, and was much improved chemically; while 99·26 per cent. of the microbes were, on the average, removed by storeage and filtration. The deep-well waters of the Kent, Colne Valley, and East London Companies and of the Tottenham Local Board of Health were of excellent quality for dietetic purposes. All these waters were clear and bright without filtration; and that of the Colne Valley Company was softened before delivery, and thus rendered suitable for washing. Seen through a stratum 2 feet deep, the Kent, Colne Valley, Tottenham, New River, and East London (deep-well) waters were clear and colourless; the East London (river supply), clear and nearly colourless; and the remaining waters, clear and very pale yellow. The bacteriological examination of the raw river and gravel water, and of those supplied by the various Companies, collected on the 4th, 19th, and 20th, gave the results contained in the following table:—

	Microbe Colonies per Cubic Centimetre.		Temperature in Deg. C.
Raw River Waters.			
Thames at Hampton	2132	..	18·2
New River Cut	3934	..	17·0
Lea at Angel Road	8816	..	18·2
„ after storeage	2474	..	17·8
River Supplies.			
Chelsea	13	..	19·0
West Middlesex	10	..	18·7
Southwark, No. 2 Well	6	..	18·0
„ gravel water	22	..	17·5
Grand Junction, Hampton, Local Supply	38	..	18·3
Lambeth	27	..	18·5
New River main filter shaft (*a*)	37	..	17·5
East London, No. 1, Essex Well	38	..	17·8
„ „ No. 11, filter	110	..	18·0
„ „ No. 12, „	49	..	18·2
Deep Well.			
Kent	3	..	11·3

(*a*) Collected during heavy rain.

Thus, the water of the Kent Company was distinguished for its very great bacterial purity; while of the filtered river waters, those delivered by the Chelsea, West Middlesex, and Southwark were the best in this respect."

In the course of their report for the past month to the Official Water Examiner (General A. de Courcey Scott, R.A.), Messrs. Crookes and Odling say: "Of the 175 samples, only one was recorded as 'clear, but dull.' All the others were clear, bright, and well filtered. In our last report, we drew attention to the long drought, which towards the end of June showed signs of breaking. The rainfall at the time of reporting was too slight to produce any difference in the quality of the waters. This month, however, the rain has been somewhat excessive; the total amount being 3·7 inches at Oxford, whereas the average fall for 25 years is 2·58 inches. The effect of this excess of rain is well seen in the following table:—

1893.	Common Salt per Gallon.	Nitric Acid per Gallon.	Hardness. Degrees.	Oxygen required for Oxidation per Gall.	Organic Carbon per Gallon.	Colour. Brown.	Colour. Blue.
May	2·496	0·611	14·66	0·029	0·062	11·3	21
June	2·155	0·601	14·74	0·033	0·065	—	20
July	2·113	0·674	13·99	0·036	0·070	15·9	29

The common salt and the hardness have diminished, consequent on the more flooded state of the river. The organic carbon and oxygen

*By a printer's error in the report as given in the Registrar-General's return, the percentage improvement of this Company's water last month was given as 35·95, instead of 85·95.

required to oxidize it have increased, but only in the third decimal place—a negligible amount; and the brown colour is also slightly higher, all pointing to more organic matter in the July than in the June waters. At the same time, the nitric acid has risen; showing that, whatever the source of the organic matter might have been, the self-purifying power of the stream was well able to deal with the nitrogen present. The colour of the water points to a peaty origin for the organic matter; and this is borne out by the reduction in the amount of common salt—showing that the organic matter must have been chiefly of vegetable origin. Considering that July has experienced a sudden and excessive rainfall, following on one of the longest droughts on record, the excellent quality of the Metropolitan waters during the month points to a very high average standard of purity."

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Peebles Gas Company yesterday held their annual meeting; and besides declaring the customary dividend of 10 per cent., they resolved to reduce the price of gas from 5s. to 4s. 7d. per 1000 cubic feet. This gives some indication of the value of the oil process. The Company have worked it since last October, along with coal contracted for at a high rate. The results, though thus partially dislocated by the coal, have been satisfactory; and this a first move has been made in the matter of adjusting the price to the cheaper oil. In fixing the price, regard must needs be had to the fact that less of the rich oil gas is required than of the ordinary coal gas; and that the 5d. which has been taken off, does not represent all the reduction. In Peebles, gas last winter was of 30-candle power; and the price (5s. per 1000 cubic feet) thus represented 2d. per candle. This price was fixed when the gas was of 25-candle power; so that, since October last, the Company have been making a present to their consumers of 5-candle light—or, rather, supplying gas at 10d. per 1000 cubic feet below the value they fixed at the beginning of the year. This 10d. has now to be taken into account; and adding it to the 5d. announced, the actual reduction, light for light, is 1s. 3d. per 1000 cubic feet. Supposing the 5d. to be due to the cheaper coal which can now be obtained, there would still be the 10d. reduction, which is quite a satisfactory outcome in a place like Peebles, where establishment and other charges are relatively higher than they are in larger works.

The Ellon Gaslight Company, which supplies a small town in Aberdeenshire, have converted their works into an oil-gas installation on the Alexander-Paterson system. I think this is the second instance of the kind in Scotland; the other being Colinsburgh, in Fifeshire. In a rather curiously worded announcement of the introduction of the new process, it is stated that, "with the best cannel costing them £2 per ton, they could not make the charge less than 13s. 4d. per 1000 cubic feet of gas consumed, while at times the rate would have been as high as £1 1s." It is not stated that the best cannel was used, or that those prices were actually charged. I find that 10s. 10d. was the price ordinary consumers paid during the past year or two, which would seem to mean that the best coal was not used. This is a mercy to the inhabitants of Ellon, who, if they had had to pay from 13s. 4d. to £1 1s. per 1000 cubic feet for their light, would have been almost ruined. But probably the author of the description I have seen intended to show by analogy how cheap gas can be made from oil. He goes on to state that the oil, which is an intermediate paraffin, is delivered at the works at 3¾d. per gallon; that 12 gallons produce about 1000 cubic feet of gas; and that the cost of production will be from 3s. 6d. to 4s. per 1000 cubic feet. Of course on-cost, loss by leakage (which is very heavy), and all other charges are here excluded, though they were included in the high charges quoted for coal gas. This is a very misleading way of putting the comparison. It is certainly misleading to the townspeople; and the Patent Paraffin Gas Lighting Company ought to have a grievance against the author for placing the results before the public in such a loose way. The Company guarantee that 60-candle power gas will be supplied, which is, it is well known, quite correct; and the Gas Company are, after a short trial of the plant, to announce the reduction they are to make on the price of gas.

Mr. Alex. Smith, the Engineer of the Aberdeen Gas Corporation, has presented a report to his Committee on the manufacture of gas from oil, which, I understand, deals with the several leading processes now before the public. The report is to be printed and circulated among the members before being considered. In it, I believe, Mr. Smith recommends caution in dealing with the matter. There is everything to be said in favour of Mr. Smith's recommendation. But I hope he does not by any means intend that the Committee are to enter upon the consideration of the subject with a prejudice against any or all oil processes; because, whatever difficulties there may be in the way of the oil-gas manufacturer, there is undoubtedly a future before him, were it in no other capacity than as a regulator of the coal market. I expect, however, that oil will take a higher place than that, and will be a cheapener of gas to the consumer.

Mr. Smith has completed the excavation of the tank for his new gasholder at Gallowhills; and the work of constructing the walls is proceeding. The work of excavation was begun last winter, when a great many men were out of work, and labour was very cheap. The consequence is that the job has been finished under the estimated cost. The total cost has been £6276, of which £3835 was for wages, and £2441 for tools and materials. The tank is being built of concrete, with hoops of iron inserted. Tenders are about to be asked for the construction of the holder, which is to be of 4½ million cubic feet capacity, and will be among the largest in Scotland. It is situated about half a mile from the works, with which it is to be connected by a trunk main 30 inches in diameter. The holder will be used only for storeage purposes; the distributing plant continuing to be connected with the existing holders, which are situated within the gas-works, and which will be replenished, as required, from the new holder. In this way, full use may be taken of the new holder; and the distributing arrangements will not be disturbed.

The Forfar Gas Corporation have closed their year, adopted their accounts, and made their arrangements for the current year. There is more than one reason for regret in connection with the gas undertaking in Forfar. In the first place Mr. Esplin, the Manager, is in indifferent health, and is not able to give the full attention to his work which it really requires. Then the works are not in the best condition. It is now seven years since Mr. Esplin requested that they should be enlarged; and his recommendation was backed up by a report from Mr. M'Crae, of Dundee. But the Corporation were at that time afraid of the advance which electric lighting was making; and they foolishly resolved to do nothing. This was but a playing into the hands of the electricians; because, if they had understood their business, the best way to keep out electricity was to have the gas-works in the best possible condition, so that gas might be sold at the cheapest rate. The consequence of their policy is that, though the works are no larger than they were in 1886, the output of gas has risen from 26½ to 28 million cubic feet a year; and this increased output having had to be provided by the old restricted plant, the work was conducted on costly lines, which kept up the price of gas. In his report, Mr. Esplin stated that, during the period of greatest consumption, there is storeage for little more than half a day's supply. In Forfar, the busiest part of the week is from Monday to Friday; and during that time the retorts are worked to their utmost capacity. Then on Saturday and Sunday, when there is less consumption, on account of want of storeage accommodation the heats have to be let down. This entails the necessity for employing three extra men in the retort-house from October to February; and the laying off of some of the retorts weekly lowers the heats and leads to a loss. Mr. Esplin estimates this at 10 per cent. of their coal during the whole year. In support of this view, he quotes from Mr. G. R. Hislop's letter in the JOURNAL for the 8th inst. He estimates that, with proper storeage, he would save £411 a year to the Corporation, besides the extra gas which he would obtain from the coal. In a discussion which followed the presentation of the report, Mr. Esplin stated that he had last year estimated for a yield of 10,000 cubic feet of gas per ton of coal; but he did not get much more than 8000 cubic feet. The discussion was rather acrimonious—that quality being imparted to it by a Mr. Hanick, who was described by one of his supporters as having been connected with the making of gas-works. I have come to hold the view, curious though it may seem, that the man who knows, or thinks he knows, about the technical side of gas-making is not suitable for appointment upon a Gas Commission. Such a man, according to my observation, is more likely to hamper than to assist the Manager. This is what I consider Mr. Hanick is just now doing with Mr. Esplin. For instance, he holds the opinion that there is sufficient plant in the works to meet the demand; and he ventured the opinion that more gas might be obtained than Mr. Esplin gets, by using four-hour charges. Now, just to criticize Mr. Hanick, how would his balance-sheet be at the end of the year if he used, say, three-hour charges. He would certainly get more gas, but what of his coal account? The extra yield of gas would be at a sacrifice of coal, which Mr. Esplin is striving to avoid. The Corporation resolved to visit the gas-works, and see for themselves how matters stood. The visit took place on Thursday. After explanations by Mr. Esplin, they seemed to be convinced that something was needed; and instructions were given to Mr. Esplin to prepare estimates of the cost of the alterations he proposes. A site for a new gasholder can be had within the works, which will make the outlay easier upon the Corporation. I am, unfortunately, unable to say much as to the results of last year's working. The Corporation seemed not to wish themselves to say very much on the subject. They consumed 417 tons of coal more than was estimated for last year, and spent £90 more than the estimate upon wages. But, on the other hand, they realized £118 more for tar and liquor. They had a deficit on the year of £456. This year's estimate is for a revenue of £6215; and with gas continued at 4s. 6d. per 1000 cubic feet, it is expected that the deficit will be reduced to £57.

Mr. Hubert Pooley, the recently appointed Manager of the Dunfermline Gas Company, is on all hands receiving credit for the energy with which he is carrying out the extensive works the Company have in progress. The new works in Grange Road are being pushed forward rapidly, so as to have them in operation during the ensuing winter. So also is the work of laying the new 12 and 10 inch mains which are being substituted for 5 and 4 inch pipes in the burgh; and locally satisfaction is being expressed that the arrangements for this work have been made so as to interfere as little as possible with street traffic. The consequence is that Mr. Pooley has been established as a favourite all round, which must be exceedingly gratifying to him on taking over the management of works which were so long in the hands of a man of the ability of the late Mr. Mackenzie. Perhaps Mr. Pooley's best stroke of management consists of the fact that, three months after taking up the control, he has been able to announce a reduction in the price of gas from 3s. 9d. to 3s. 7d. per 1000 cubic feet. Considering the large outlay the Company are incurring at present in connection with the transference of their works to a new site, this is a handsome thing to do; and it shows that Mr. Pooley is resolved that the success of the Company is to depend upon good management quite as much as on cheap coal and the like.

Sheriff Davidson, of Lanarkshire, has decided in favour of the Bothwell Gas Company in the action for an interdict, to which I have previously referred, at the instance of the Company against the County Council. The dispute arose out of the charge for water supplied to the gas-works; and the action took the form of an interdict against the County Council cutting off the supply. His Lordship grants a perpetual interdict, with expenses.

It is still another indication of the good opinion which was held of Mr. J. Mackay, the late Manager of the Peterhead Corporation Gas-Works, that on Monday night he was entertained to dinner by the inhabitants of Peterhead before his departure, and was presented with a bookcase and a cabinet with writing-desk.

I find that in my note last week regarding the transfer of the North Berwick Gas Company's undertaking to the Town Council, I erred in stating that Mr. J. M'Gilchrist, of Dumbarton, represented the Company. The Company were represented by Mr. R. Mitchell, of Edinburgh, and Mr. M'Gilchrist acted for the Corporation.

Sulphate of ammonia is now quoted at £15 5s. per ton—a rise of about 10s. during the present week.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Aug.* 26.

Sulphate of Ammonia.—The market seems to be practically in the hands of one or two sellers; and prices are consequently purely nominal. It is said that £15 has been paid; and £15 5s. is reported to have been done in a solitary instance. The latter figure is an advance of about £1 per ton for the week, and recalls the times of yore. Gas liquor has never been scarcer; and it now looks as if the production of 1893 was to fall behind that of 1892. While supplies remain so scarce, it is impossible to predict the future of the market. As may be expected, forward contracts "hang fire;" and quotations are running between £13 10s. and £14. Nitrate is dull and unchanged.

LONDON, *Aug.* 26.

Tar Products.—The great coal strike has put quite a new complexion on the value of pitch; the Continental fuel makers having become extremely busy, owing to the cessation of shipments of fuel from this country. If the strike continues, the value of pitch will certainly go higher. Important business is reported at 23s. 9d. to 24s. 3d., according to the port of shipment, which is nearly a shilling improvement on the week. The other products unfortunately continue difficult to sell at decreasing prices. A large parcel of anthracene, moderate "A" quality, outside the "Committee," is said to have realized 11½d. This sale has encouraged the "Committee" to stick to the prices they are asking. Business has been done at the following rates: Tar, 11s. 6d. to 13s. 6d. Pitch, 23s. 9d. to 24s. 3d. Benzols, 90's and 50's, 1s. 5½d. Creosote salts, 16s. Creosote, 1d. Solvent naphtha, 1s. 1d. Toluol, 1s. 4d. Crude benzol naphtha, 30 per cent., 6¾d. Carbolic acid, 60's, 1s. 6d.; crystals, 6½d. Cresol, 1s. 6d. Anthracene, nominal, 30 per cent., "A," 1s. 1d.; "B," 9d.

Sulphate of Ammonia.—A most determined effort is being made to prevent the price going higher; but, in the absence of stocks anywhere, it is most unlikely to succeed. Business has been done during the week at prices ranging between £14 10s. and £15; while £13 10s. to £14 is asked for October-March delivery. Gas liquor is quoted at 9s. 6d. to 10s. 6d.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Any immediate prospect of a settlement of the wages dispute has been altogether dissipated by the decision of the Miners' Federation Conference in London; and though the proposed conditions for a general resumption of work will be brought under the consideration of the Committee of the Coalowners' Federation which is meeting in London to-day (Tuesday), there is no chance whatever that it will be accepted. The stoppage is now generally regarded as likely to go on well over next month. A good many of the collieries have still stocks which will enable them to meet the requirements of their customers for the next few weeks; although it is probable that users of manufacturing classes of fuel will have to go on the better qualities of round coal at a necessarily enhanced price, whilst gas-works, whose deliveries under contract are suspended, and whose stocks in some cases are getting low, will be placed in a similar position. Prior to the miners' conference, there was a very general holding back from placing orders, in the expectation that at any rate there might possibly be some partial resumption of work; and there is consequently an influx of orders, which is causing a renewed pressure for supplies. So far, there is no material change in prices beyond what was referred to last week. The best screened coals have got up to 15s. and 16s. per ton; whilst through-and-through coals, which represent generally the class of fuel that is now being used for forge and steam purposes, range, according to quality, from 12s. 6d. up to 14s., with engine fuel fetching from 10s. to 12s. per ton at the pit mouth. The advanced prices which have now to be paid are, however, bringing about a more or less general contraction of manufacturing operations in all branches where anything like large supplies of fuel are necessary. Most of the finished iron works are either wholly or partially stopped; and the chemical manufacturers are also very seriously affected by the stoppage, although in some cases they had taken the precaution of getting in exceptionally large stocks. In the shipping trade, business is altogether disorganized; and a good deal of it is going away into other districts—where the pits are working. South Wales has largely supplied the requirements of vessels that usually come into the Mersey; whilst considerable quantities of Scotch coal have also been coming into Lancashire. For ordinary Lancashire steam coal, delivered at the ports on the Mersey, the prices quoted are about 16s. to 16s. 6d. per ton; but it is difficult to give any really definite figures—they are so liable to day-to-day variations.

Northern Coal Trade.—The extreme pressure for coal has been lessened during the past few days by the return of the miners in Wales to work, and the consequential withdrawal of some orders that might otherwise have remained here. Prices are thus more settled; and there is, with a very large output of coal, a full demand at better prices on the average. There are large quantities of coal being delivered at low prices on old contracts; but there are also now fair lots that are sold at considerably advanced rates. Best Northumbrian steam coals are in strong demand. Most of the collieries have orders ahead for some weeks to come; while all quantities produced that are not contracted for, are readily sold at high prices. As much as 17s. per ton has been freely asked and paid to obtain prompt supplies; but now that the pressure has gone, the prices are lower. Possibly from 14s. to 15s. may represent the rates which are currently asked; while large quantities of steam coals are being sold, on old contracts, at from 8s. 6d. to 9s. 6d. per ton, free on board. Second-class steam coals are steady in demand; but the price varies very much. Small steam coals, being in rather heavy supply, are now obtainable at from 5s. to 5s. 6d. per ton. Bunker coals have fallen in price during the last few days, and are now in abundant offer at from about 8s. to 9s. per ton, free on board, for unscreened Durham kinds. In gas coals, there is a steady and a growing demand; and the consumption is being enlarged. But there is no rush such as some had expected, though there have been sales at higher prices to some Midland gas companies, who have been driven into this market. The fact that this is a rather dull season with the gas coal collieries explains why the larger demand has been met without much difficulty—by the working of fuller time than would otherwise have been done. The price of gas coals has varied very greatly. One lot sold for inland use was at 7s. 6d. free on rail at the pit—a price that is a smart advance on that at which most of the large contracts have been taken. Manufacturing coal is steady; and some of the South Durham collieries are selling large quantities to Yorkshire. Coke is firm; the price for export being now about 16s. 6d. per ton, free on board. The demand for local furnaces is rather larger. There is little or no alteration in the price of gas coke; but the output is increasing.

Scotch Coal Trade.—Scotland is now in the thick of a struggle in the coal trade, though happily not to so large an extent as is the case in England and Wales. During the week the Fife men, to the number of about 11,000, have been on strike against an offer of 12½ per cent. increase of wages; the demand of the men being 25 per cent. The result has already been to drive many vessels, which were waiting for cargo, to North of England ports. It is not likely, however, that the struggle will last long, as the latest report is that the men have offered to again meet the masters in conference. This is probably owing to the action which has been taken in the West of Scotland, where the men, though demanding 2s. per day advance, have agreed to accept the masters' offer of 1s., and are working regularly five days a week of eight hours per day. The men have thus received a rise of 2s. in two weeks. There has, on account of this action by the men, been quite a spurt in the west, which the Fife men are beginning to be afraid will take away some of their trade. In the Lothians the men have not struck work, but have agreed to have an interview with the masters in Edinburgh on Wednesday next. During the week prices have ruled high for all descriptions of coal. Main has sold at from 11s. to 12s.; ell, at almost the same figures; splint, at 11s.; and steam, also as high as 18s. per ton. The shipments for the week amounted to 174,653 tons—an increase on the preceding six days of 17,462 tons; but a decrease on the corresponding week of last year of 2873 tons. For the year to date, the total shipments have been 4,339,439 tons—a decrease for the year of 375,604 tons.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 396.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	13 Apl.	10½	Alliance & Dublin 10 p. c.	10	17½—18½	..	5 13 6
100,000	10	,,	7½	Do. 7 p. c.	10	12—13	..	5 15 4
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	102—104	..	4 16 2
100,000	20	31 May	8	Bahia, Limited	20	10½—11½	..	13 18 3
200,000	5	12 May	6½	Bombay, Limited	5	5¾—5¾	–¼	5 13 0
40,000	5	,,	6½	Do. New	4	3¾—4	–¼	6 10 0
380,000	Stck.	16 Aug.	11½	Brentford Consolidated	100	217–222*	..	5 3 7
180,000	,,	,,	8½	Do. New	100	163–168*	..	5 1 2
220,000	20	15 Mar.	11½	Brighton & Hove Original	20	41—43	..	5 6 11
888,500	Stck.	31 Aug.	5	Bristol	100	104—107	..	4 13 5
320,000	20	13 Apl.	11½	British	20	42—44	..	5 4 7
50,000	10	15 Mar.	11½	Bromley, Ordinary 10 p. c.	10	19—20	..	5 15
51,510	10	,,	8½	Do. 7 p. c.	10	15—16	..	5 6 3
328,750	10	28 July	2	Buenos Ayres (New) Limited	10	5½—6½	..	3 1 6
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	97—100	..	6 0 0
150,000	20	13 July	8	Cagliari, Limited	20	25—27	..	5 18 6
550,000	Stck.	28 Apl.	12½	Commercial, Old Stock	100	243—248	..	5 0 10
165,000	,,	,,	9½	Do. New do.	100	185—190	..	5 0 0
160,762	,,	15 June	4½	Do. 4½ p. c. Deb. do.	100	125—130	..	3 9 3
800,000	Stck.	15 June	13	Continental Union, Limited	100	228—233	..	5 11 6
200,000	,,	,,	10	Do. 7 p. c. Pref.	100	190—195	..	5 2 7
75,000	Stck.	15 Mar.	10	Crystal Palace District	100	190—195	..	5 2 7
486,090	10	28 July	10	European, Limited	10	21—22	..	4 10 11
354,060	10	,,	10	Do. Partly paid	7½	15—16	..	4 13 9
5,646,590	Stck.	16 Aug.	12	Gaslight & Coke, A, Ordinary	100	223–228*	..	5 5 3
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	94–98*	..	4 1 7
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	260–265*	..	3 15 6
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	120–125*	..	4 0 0
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	175–180*	..	4 3 4
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	167–172*	..	4 1 5
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	259–264*	..	3 15 9
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	155–160*	..	3 15 0
1,061,150	,,	15 June	4	Do. 4 p. c. Deb. Stk.	100	125—128	..	3 2 6
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	128—132	..	3 8 2
908,000	,,	,,	6	Do. 6 p. c. do	100	172—177	..	3 7 9
5,800,000	Stck.	12 May	12	Imperial Continental	100	223—228	+1	5 5 3
75,000	5	15 June	6	Malta & Mediterranean, Ltd.	5	5—5½	..	5 9 1
560,000	100	4 Apl.	5	Met. of Melbourne, 5p. c. Deb.	100	103—105	..	4 15 3
541,920	20	15 June	5	Monte Video, Limited	20	12¾—13½	..	7 8 2
150,000	5	31 May	10	Oriental, Limited	5	7½—8	..	6 5 0
60,000	5	29 Mar.	7	Ottoman, Limited	5	4¼—4¾	..	7 3 8
166,870	10	—	2	Pará Limited	10	2—2½	..	—
				People's Gas of Chicago—				
420,000	100	2 May	6	1st Mtg. Bds.	100	100—105	..	5 14 3
500,000	100	1 June	6	2nd Do.	100	98—102	..	5 17 8
150,000	10	28 Apl.	5	San Paulo, Limited	10	8¼—9¾	..	5 5 3
500,000	Stck.	24 Feb.	15½	South Metropolitan, A Stock	100	297—302	..	5 2 8
1,350,000	,,	,,	12	Do. B do.	100	241—248	..	4 16 9
260,000	,,	,,	13	Do. C do.	100	253—258	..	5 0 9
750,000	,,	13 July	5	Do. 5 p. c. Deb. Stk.	100	148—152	..	3 5 9
60,000	Stck.	15 Mar.	11½	Tottenham & Edm'nton, "A"	100	215—220	..	5 4 6
				WATER COMPANIES.				
744,897	Stck.	29 June	10	Chelsea, Ordinary	100	263—268	+3	3 14 7
1,720,252	Stck.	29 Mar.	8	East London, Ordinary	100	213—218	..	3 13 5
544,440	,,	29 June	4½	Do. 4½ p. c. Deb. Stk.	100	140—143	..	3 2 11
700,000	50	15 June	8½	Grand Junction	50	110—113	..	3 15 2
708,000	Stck.	16 Aug.	11	Kent	100	275–280*	..	3 18 6
1,043,800	100	29 June	9½	Lambeth, 10 p. c. max.	100	239—241	..	3 17 10
406,200	100	,,	7½	Do. 7½ p. c. max.	100	197—202	..	3 14 6
310,000	Stck.	29 Mar.	4	Do. 4 p. c. Deb. Stk.	100	129—132	..	3 0 7
500,000	100	16 Aug.	12½	New River, New Shares	100	325–330*	..	3 13 6
1,000,000	Stck.	28 July	4	Do. 4 p. c. Deb. Stk	100	132–135	..	2 19 3
902,300	Stck.	15 June	6	S'thwk & V'xhall, 10 p. c. max.	100	149—154	..	3 18 0
126,500	100	,,	6	Do. D 7½ p. c. do.	100	140—145	..	4 2 9
1,155,066	Stck.	15 June	10	West Middlesex	100	258—263	..	3 16 0

*Ex Div

Lighthouse Illumination.—In the House of Commons last Friday, Mr. Ross asked the President of the Board of Trade whether the Commissioners of Irish Lights had applied for the sanction of the Board of Trade to their proposal to establish a fixed electric light at the Old Head of Kinsale; if he was aware that, in the opinion of experts of high standing, the giant lens lighthouse gas-light would be much more effective; if Mr. J. R. Wigham, of Dublin, had offered to pay all the expenses of a practical test of the comparative merits of those two lights; and if he would insist on that test being made. In reply, Mr. Mundella said he had already stated that the Trinity House declined to approve the proposal to establish an electric light at Kinsale Head. He was aware that there was a difference of opinion as to the comparative merits of electric, gas, and oil lights in foggy weather. The Board of Trade had received an offer from Mr. Wigham to pay the expenses of experiments with his new "intensity burner" and "giant lens;" and they had referred this offer to the Irish Lights Commissioners and the Trinity House for their observations. In reply, the former body sent to the Board of Trade a copy of a report from their scientific adviser on the subject, and of a letter they had written to Mr. Wigham, stating that they did not consider it would be wise to enter into any experiments at present. The Trinity House had asked for further information respecting the desired experiments. It was not the province of the Board of Trade to instruct the lighting authorities in such matters; and they had no power to insist upon such tests being made.

Sales of Shares.—On Tuesday last, some old £20 shares in the *Tamworth Gas Company* were sold at £40 each, and new £20 shares, at £28 and £28 10s.——At a sale at Sheffield, ten new ordinary £10 (1885) fully-paid shares in the *Grimsby Gas Company* realized £15 10s.

Dispute as to the Public Lighting of Winchcombe.—At the Winchcombe County Court recently, His Honour Judge Ellicott had to decide a dispute between the local Gas Company and the Lighting Inspectors with reference to the payment for the gas consumed during the December quarter of last year. The consumption of gas by the whole of the lamps was calculated upon the amount burned by one metered lamp; and this had always been admitted as fair until an account for £49 1s. 3d. was rendered for the quarter in question. This was more than the usual sum; and the Inspectors declined to pay it, and tendered £38 18s. 1d., subject to the condition that a receipt must be given in full. In their evidence, the Inspectors tried to show that the lamps could not have consumed the quantity of gas charged for, owing to the frost interfering with the supply; but His Honour, in giving judgment, said that the Company's Manager had proved that it was the duty of the Inspectors to find new burners and regulators, and, as they did not do so, the increased pressure of gas which had to be given during the winter months would account for much of the additional consumption. The lamplighter, too, was a servant of the defendants; so that any impropriety on his part could not be fastened on to the plaintiffs. He gave judgment for the Company for the full amount claimed, with costs.

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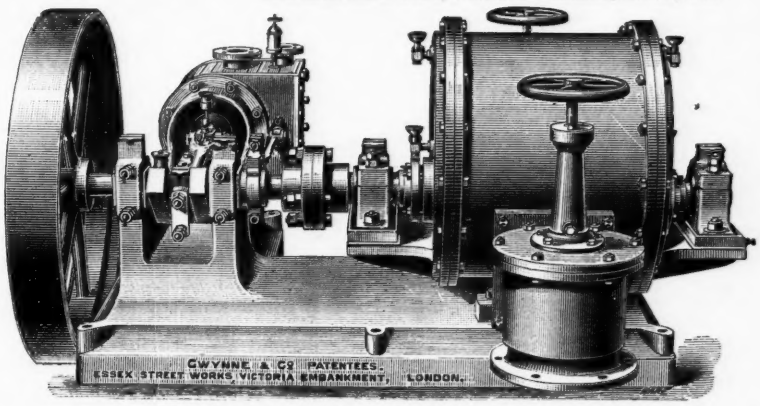

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W. C. HOLMES & Co., Huddersfield; AND 60, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Setting.
*** See Advertisement p. II., centre of JOURNAL.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
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LIQUOR, Tar, and Spent Oxide wanted. BROTHERTON AND CO., Ammonia and Tar Distillers, BIRMINGHAM, LEEDS, and WAKEFIELD.

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BALE & CO., direct Importers from Ireland. Sample and Price on application.
OXIDE PAINT, SULPHURIC ACID, & Chemicals.
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FINEST Quality of Natural Bog Ore. Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

MESSRS. DEBENHAM, TEWSON, FARMER, and BRIDGEWATER'S MONTHLY LIST of Shops, Show-Rooms, Factories, and Waterside Premises, suitable for the Exhibition and Manufacture of Engineering and other Appliances, may be obtained, free of charge, at their Offices, 80, CHEAPSIDE, E.C.

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JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

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TUBES and Fittings for Gas, Steam, and Water, in stock to 8 inches diameter; Iron and Steel Ascension-Pipes.
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PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors, for the erection of Gas-Works for Towns, Villages Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
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HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works sundries.
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JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

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OILS for Gas Enrichment and Manufacture. AGENCY wanted.
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ADVERTISER seeks re-engagement in large or small Works as STOKER. Used to Ordinary and Generator Firing. Age 23; abstainer.
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WANTED, a re-engagement as Retort SETTER. Over 20 years' practical experience. Can work to any Plan or Setting.
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WANTED, a Stoker to take charge of a small Gas-Works (about 2½ millions). A Man is engaged to assist for four months during the Winter. Wages 21s. per week, with Cottage, Coal, and Gas.
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WANTED, two good Stokers used to charging by Shovel, and with a knowledge of Exhauster, &c. Total Abstainers preferred. Testimonials from last employer.
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WANTED, a Man to manage the above Works. Production, about 3 millions. House, with good Garden, Gas, and Coal.
Apply, stating age, wages, and present occupation, to H. D. WILDES, Solicitor, West Malling, KENT.

KEGWORTH GAS-WORKS.

WANTED, a Man to manage (single-handed) the above Works. Production about 3 millions. House with good Garden, Gas, and Coal.
Apply, stating age, wages, and present occupation, to J. A. UTTING, Secretary, Gas Company, Kegworth, near DERBY.

WORKING Manager wanted for an improving Town. Present annual make, about 4 millions. He will have to do part Stoking, lay Mains and Services, fix Meters, &c. One who can set Retorts preferred. House, Gas, and Coal found. State terms.
Apply, by letter, to No. 2272, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a handy Mechanic as WORKING FOREMAN, for a small Gas-Works near London. One used to Forge Work, Main and Service laying, Meter reading, Engine, and Exhausters. Abstainer preferred. Wages 32s. per week.
Applications, with testimonials, to be addressed to No. 2273, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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FOR SALE—Two perfectly new Cast-Iron SCRUBBERS, 10 feet diameter by 50 feet high, with Wrought-Iron Domes, Cast-Iron Spiral Staircase, &c., complete. All plates machine planed. One or both Scrubbers will be sold to suit purchasers.
A perfectly new 30,000 per hour HORIZONTAL DOUBLE PUMP RECIPROCATING EXHAUSTER, with Steam-Engine, with Connections and Valves.
One Second-hand (thoroughly overhauled) VERTICAL PUMP EXHAUSTER, with Steam-Engine (with clean Water and Liquor Pumps attached), to pass 7000 cubic feet of Gas per hour.
The whole of the above Plant can be inspected, and full particulars with prices will be sent, on application to No. 2241, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

EXHAUSTER (Rotary), perfectly New (Makers, Dempster and Sons), 20,000 cubic feet per hour, ON SALE, cheap
Apply to T. G. MARSH, 41, Corporation Street, MANCHESTER.

FOR SALE—A 5000 feet Exhauster, by Gwynne, with outside Bearings and Couplings; also one without outside Bearings. Both in good condition.
Apply to J. CHAMBERS, Gas-Works, HENLEY-ON-THAMES.

FOR SALE—A Second-hand Station METER, in circular case, to pass 10,000 feet per hour, with 8-inch Connections and Bye-Pass. Also one 12-inch FOUR-WAY VALVE. All in good condition.
Apply to the CLERK to the Local Board, Atherton, near MANCHESTER.

TO LET or SELL, the Premises recently occupied by Mr. Thomas Illingworth (now deceased), and known as NORTH DEAN CHEMICAL WORKS, SALTERHEBBLE, near Halifax, Yorkshire.
The Premises comprise in all an area of about 13,000 square yards, with substantial Buildings thereon, including extensive Vitriol and Rectifying, Sulphate, and Tar-Distilling Plant. They adjoin the Calder and Hebble Canal, and have good Wharfage thereto, and are near North Dean and Copley Stations, on the Lancashire and Yorkshire Railway.
Apply to Messrs. GORDON, HUNTER, AND MACMASTER, Solicitors, BRADFORD.

TO GASHOLDER MAKERS.

THE Dunfermline Gaslight Company, Limited, invite TENDERS for the construction and erection of a TELESCOPE GASHOLDER.
The Drawings and Specification may be seen at the Gas Office, Dunfermline, and at 5, Norfolk Street, Manchester, the Office of the Engineer, Mr. Thomas Newbigging, C.E.
Copies of the Bill of Quantities and Form of Tender may be obtained from the latter on deposit of Two Guineas, which will be returned on a *bonâ fide* tender being sent in.
Sealed tenders, endorsed "Gasholder, Contract No. 11," to be addressed to the Chairman of the Company, Dunfermline, and sent so as to reach me by Ten o'clock on the 4th of September prox.
By order,
HUBERT POOLEY,
Manager and Secretary.
Gas Office, Dunfermline,
Aug. 21, 1893.

PONTYPRIDD URBAN SANITARY DISTRICT.

STREET-LAMP COLUMNS.

TENDERS are invited by the Pontypridd Local Board for the supply of about 50 STREET-LAMP COLUMNS of neat and modern design. Height from pavement to extreme top of column, 9 ft. 7 in.; depth of the column below pavement, 2 feet. Sketch to accompany tender. Also for a like quantity of CHAIRS to fit same.
Any further information may be obtained on application.
Sealed tenders, addressed to the undersigned, and endorsed "Tender for Street-Lamp Columns," to be delivered on or before the 20th of September next.
The lowest or any tender not necessarily accepted.
By order,
HENRY LL. GROVER,
Clerk.
Local Board Offices, Pontypridd,
Aug. 26, 1893.

BRIDGEND GAS AND WATER COMPANY.

THE Directors of the above Company are prepared to receive TENDERS for—
(1) IRON ROOFS to be erected over a new Retort-House and Coal-Store at their Gas-Works, Bridgend, Glamorgan.
(2) HYDRAULIC MAIN and RETORT FITTINGS for Twenty-four Retorts.
Drawings and Specifications can be seen, and Form of Tender obtained, on application to the undersigned, at the Gas Offices, Bridgend, Glamorgan.
Sealed tenders to be sent in on or before the 11th day of September, 1893, addressed to the Chairman of the Bridgend Gas and Water Company, and endorsed "Tender for Roofs," or "Tender for Retort-Fittings," as may be.
The Directors do not bind themselves to accept the lowest or any tender.
J. H. DYER,
Secretary and Manager.
Gas Offices, Union Street, Bridgend,
Aug. 24, 1893.

NOW READY.

GAS AND WATER CO.'S DIRECTORY, 1893.
Seventeenth Annual Issue, 5s.
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Handsomely Bound in One Vol., Price 10s.
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1, CREED LANE, E.C.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cubic feet.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to
THE WALLSEND & HEBBURN COAL COMPANY, LTD.,
B Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

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CANNEL COAL MERCHANT,
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Prices and Analysis of all the Scotch Cannels on application.

FAMOUS LEESWOOD
"CURLEY CANNEL."
YIELD: 15,306 CUB. FT. PER TON OF 30·62-CANDLE POWER.
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LEESWOOD COAL AND CANNEL MINES,
PONTYBODKIN, nr. MOLD, NORTH WALES.

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A FIRST-CLASS CANNEL COAL,
Yielding a large volume of rich Gas, and fully 60 per cent. of first-class Coke.
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Highest Results in Gas, & Excellent Coke.
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NEWBATTLE COLLIERIES,
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LONDONDERRY GAS COALS
FROM THE
MARQUIS OF LONDONDERRY'S COLLIERIES,
COUNTY OF DURHAM.
Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
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FOR PRICES AND PARTICULARS, APPLY TO
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JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
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Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.
Manufacture and keep in Stock at their Works
(also large stock in London)
PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

HOLMSIDE GAS COALS.

(Wrought out of Holmside and South Moor Collieries.)

PRESENT production 4000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16¼ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of nearly

600,000 Tons per Annum.

Full particulars on application to

MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-ON-TYNE.

CAST-IRON PIPES

FOR GAS AND WATER.

Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.

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FOR GAS, WATER, AND STEAM

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Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

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BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft
Illuminating Power	38·22 candles
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles
Coke	70 per cen'.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

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THOS. W. DANCE & SONS,
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REGENERATIVE FURNACES.

Unsurpassed in Efficiency, Economy, Durability, and Easy Working.

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COKE BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT.)

New Design, with two Cutting Rollers, making less Breeze than their old pattern.

For Exhauster Advertisement, see last week.

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PARK STREET, SOUTHWARK, E.C.,
And at STROUD, GLOUCESTERSHIRE.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.,
Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Ipswich Gaslight Company, Devonport Gas Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY,
LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON,
FITTER.

T.B.KITTEL, SHEFFIELD.

CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL

ENGLISH & SCOTCH CANNELS.

REAL SILKSTONE GAS COAL

ANALYSIS AND PRICES ON APPLICATION.

T.B.KITTEL, SHEFFIELD.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

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RAVENSTHORPE, NEAR DEWSBURY.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY
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STEEL OF ALL DESCRIPTIONS.

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SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

London Office:
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THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON AND COAL COMPANY, Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

The Analysis made by Messrs. J. and H. T. Pattinson, Public Analysts for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a Working Analysis made of these Coals by the Tudhoe and Sunderland Bridge Gas Company:—

[COPY.]

TUDHOE AND SUNDERLAND BRIDGE GAS COMPANY.

Tudhoe Gas-Works,
Spennymoor,
8th June, 1893.

Messrs. The

WEARDALE IRON & COAL COMPANY, LTD.

GENTLEMEN,

For the last two months we have used your **THORNLEY GAS COAL** exclusively at these gas-works; and I have pleasure in herewith giving you the actual results obtained during the trial.

Yield of Gas per ton: 10,300 cubic feet.
Yield of Coke: 13½ cwt.
Illuminating Power of Gas, average of a series of tests, **17 Sperm Candles.**
The Coke was of excellent quality.
The following is a complete ultimate Analysis of the Coal.

	Per Cent.
Carbon	83·123
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
	100·00

I am, Gentlemen,
Yours truly,
A. B. COWAN,
Manager.

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

MEIKLEJOHN'S PATENT
Improved Slide-Valve Anti-Dip.
Is perfectly reliable in action, and requires no attention. Has all the advantages of the Dip and Anti-Dip combined.
Is cheap and easily fixed to any form of main.
Will be found the most efficient appliance of the kind yet introduced.
Further particulars and price from
C. MEIKLEJOHN,
GAS-WORKS, RUGBY.
(Late N. MEIKLEJOHN, Longwood.)

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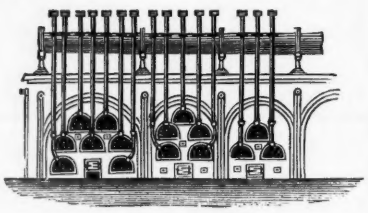

RETORT-SETTINGS,
RETORT-FITTINGS,
ELLAND.

THE SILICA FIRE-BRICK COMPANY,
OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.
Trade Mark: "SILICA."
These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY
Strongly recommended where EXCESSIVE HEATS have to be maintained.

HARPER & MOORES,
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MANUFACTURERS OF
BEST FIRE-BRICKS, GAS-RETORTS,
LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.
Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.
MANUFACTURERS OF GLASSHOUSE POTS AND CRUCIBLES OF EVERY KIND
ESTABLISHED 1836.

HYDRATED OXIDE OF IRON
FOR GAS PURIFICATION.
Two to three times as rich in Hydrate as Bog Ore.
STRONG ACTION ON SULPHURETTED HYDROGEN.
We have for sale Hydrate of Iron containing 77 per cent. of Ferric Oxide and 17 per cent. of Water. Directions given for mixing for Purifiers.
LESS THAN HALF THE PRICE OF BOG ORE.
ADDRESS—
READ HOLLIDAY & SONS, LTD., HUDDERSFIELD.

JOHN BROWN & CO., LTD., SHEFFIELD,
Proprietors of
ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.
ALDWARKE MAIN GAS COAL
Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
Telegrams: "ATLAS SHEFFIELD."

THE WIGAN COAL & IRON CO., LIMTD.,
Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.
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LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, SOLE AGENTS.
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WILLEY & Co.,
Gas Engineering Works, Commercial Road, Exeter,
MANUFACTURERS OF EVERY DESCRIPTION OF
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GASHOLDERS, Telescope and Single Lift, any size. Some of the largest in the Kingdom, erected by this Firm, are giving the highest satisfaction.
PLANS and SPECIFICATIONS furnished for **Extensions** and **Enlargement** of existing **Works,** adapting them to the most **Improved** and **Modern Principle** of **Gas Manufacture.**
PURIFIERS, CONDENSERS, WASHERS, ENGINES and EXHAUSTERS, STATION METERS and GOVERNORS, manufactured and erected.
Makers, by permission of that eminent authority **MR. GEORGE LIVESEY,** of his **CELEBRATED PATENT WASHER,** highly approved by all the Engineers of Works where adopted. Largely in demand.
Special reference and attention are invited to our
WET AND DRY METERS,
which have acquired a high reputation for the **excellence** of Materials and Workmanship; their **durability** and **accuracy** of **Register** guaranteed. They are used by several of the **London Gas Companies,** and over **200 Provincial Gas Companies.**

Price Lists, Specifications, and Estimates provided for any work appertaining to Gas Lighting, from the Retort-House to the Drawing-Room.

HEATHCOTE GAS COAL.

RICH IN ILLUMINATING POWER AND YIELD OF GAS.
ABOVE THE AVERAGE IN WEIGHT AND QUALITY OF COKE.
MAINTAINS A HIGH STANDARD IN RESIDUALS.

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MAKERS OF

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THE LARGEST GASHOLDER IN THE WORLD.

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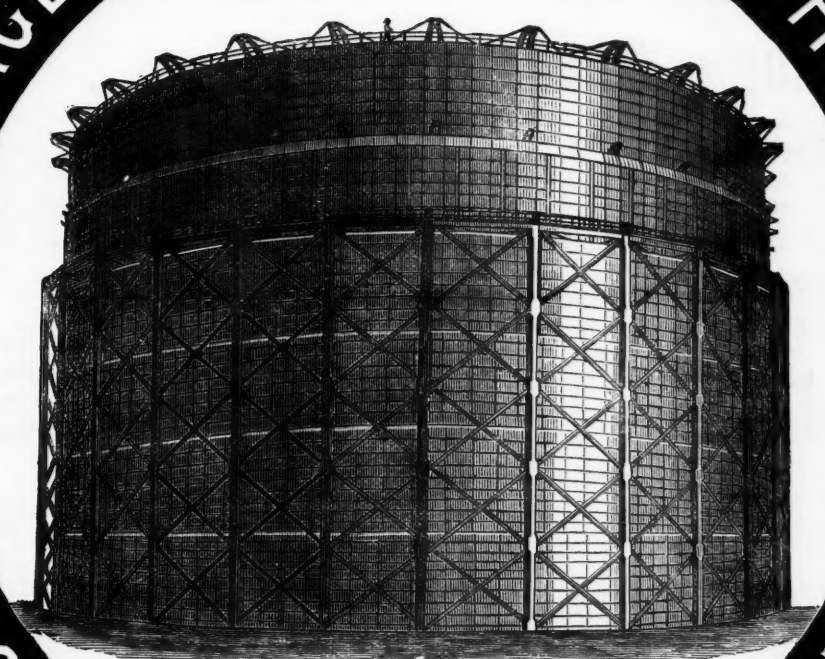

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ERECTED AT EAST GREENWICH FOR THE
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IT HAS SIX LIFTS 30 FT
DEEP EACH AND IS
300 FT DIAR

MAKERS OF GAS PLANT OF EVERY DESCRIPTION

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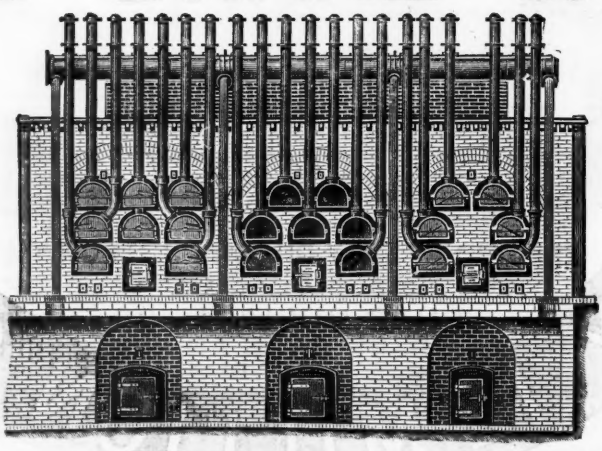

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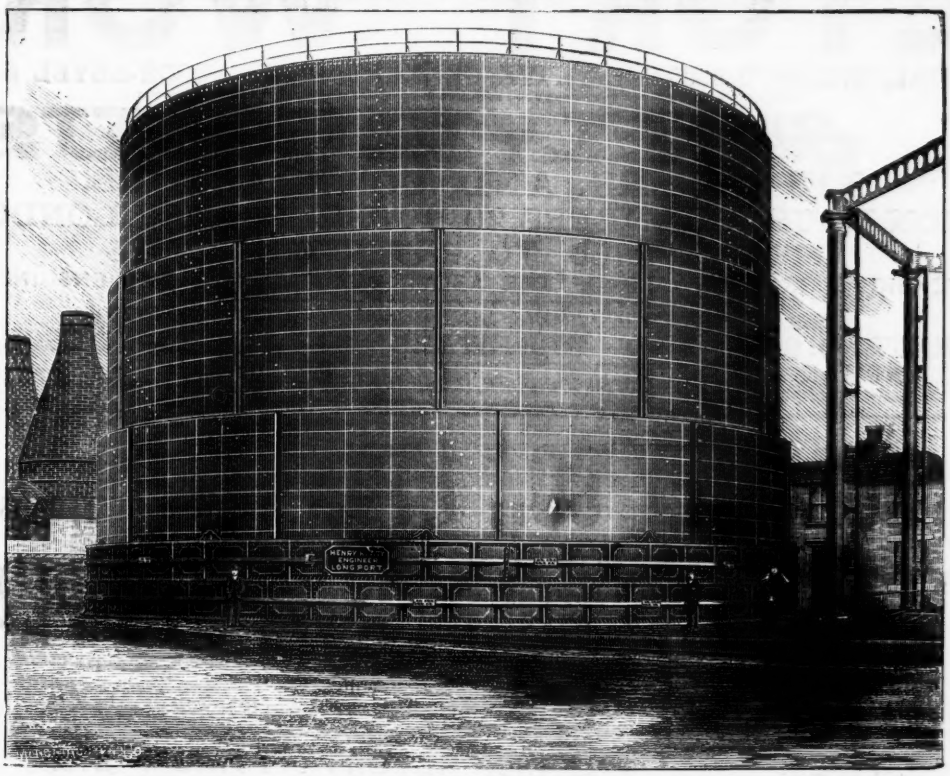

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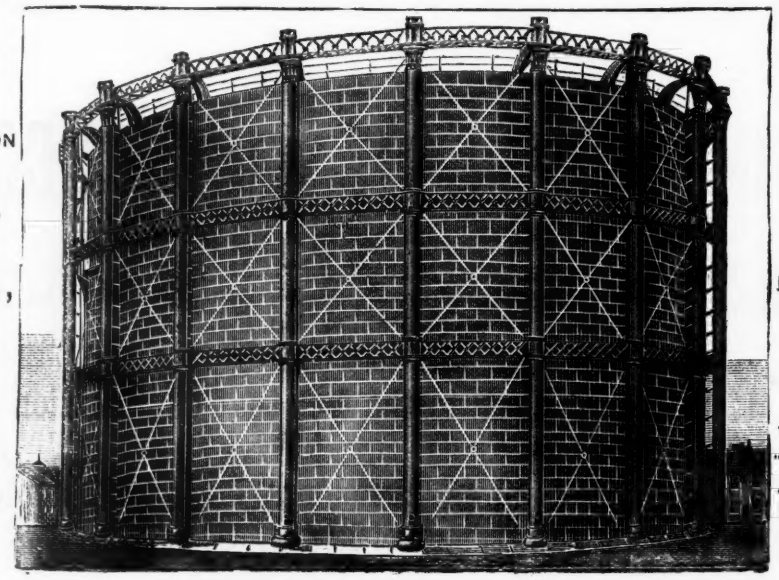

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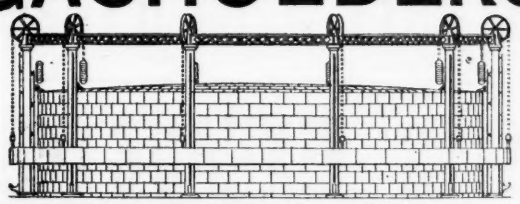

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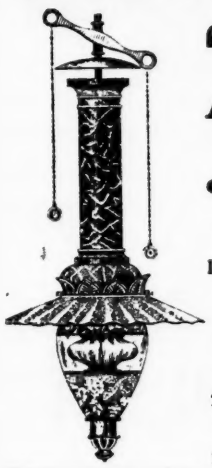

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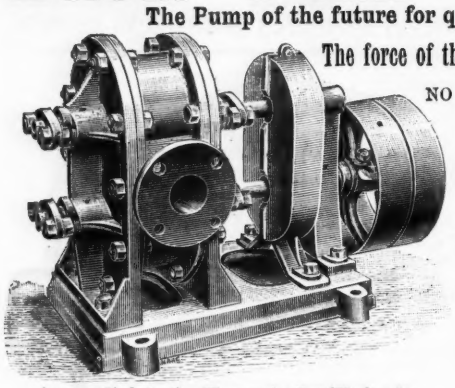

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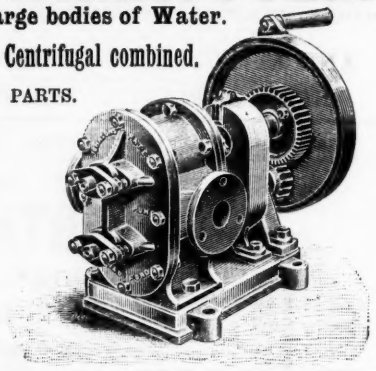

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